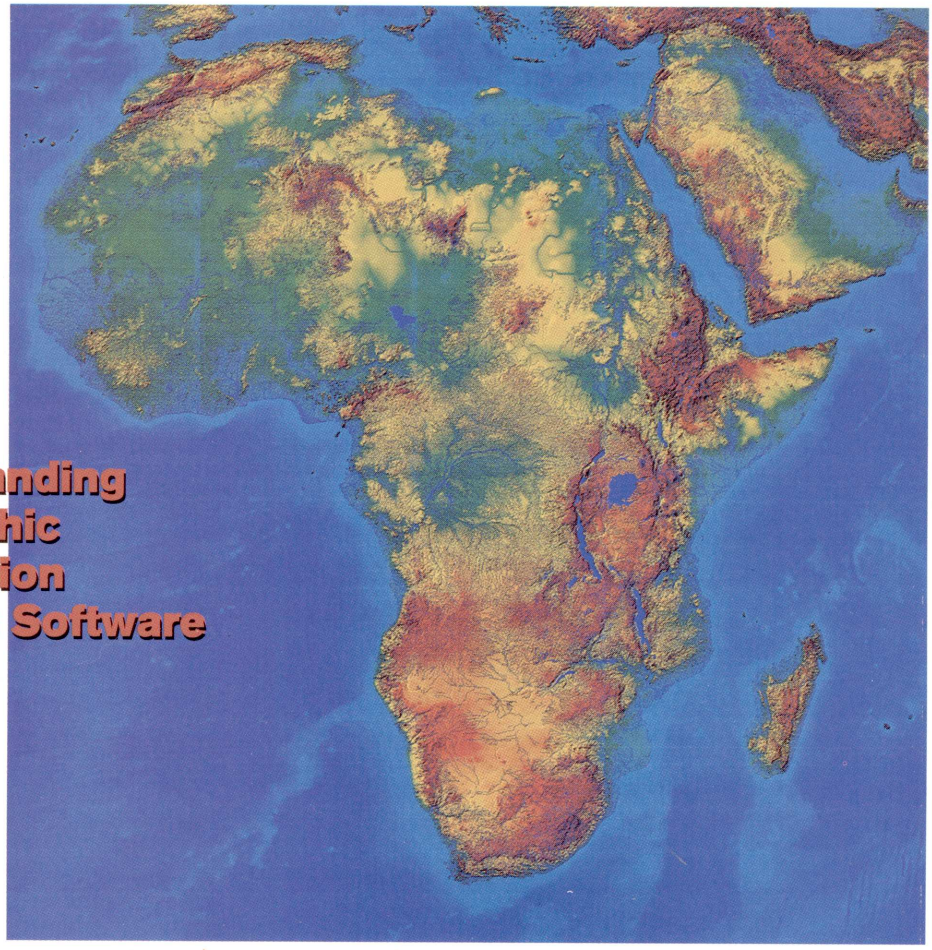
hp·ux/usr

Hands-On Solutions for HP-UX Users • January 1995



Understanding Geographic Information Systems Software

Handling Exceptions in C and C++ • **Using Non-HP Disks with HP Machines**

A Publication of Interex • The International Association of Hewlett-Packard Computing Professionals

ACC® SYSTEMS

WANSTATION™

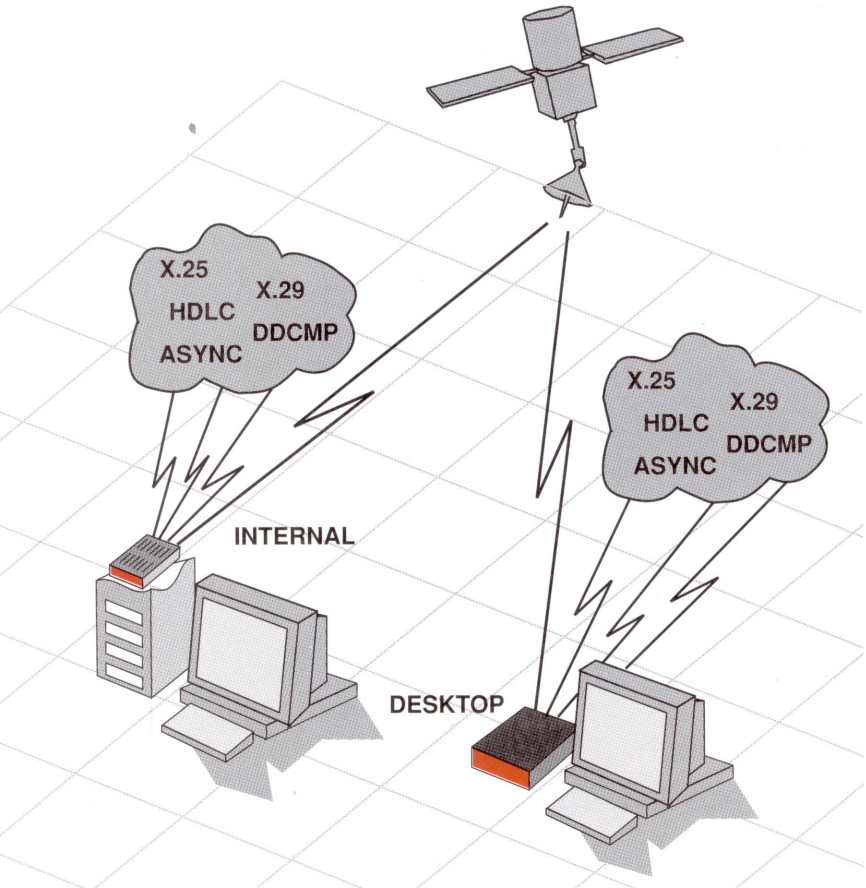
SELECTED BY NOAA / NWS FOR NEXRAD DATA APPLICATIONS

WANSTATION™ 100 for Internal Mounting
WANSTATION™ 1000 for Desktop Operation

COMMUNICATION FRONT END FOR WIDE AREA NETWORKS

The WANSTATION™ provides cost-effective high-performance Wide Area Network access for servers and workstations. The software driver, SCSITALK™, supports multichannel, multiprotocol communications and allows adaptation of custom applications.

SCSI-ATTACHED WANSTATION™ FOR INTERNAL OR DESKTOP OPERATION ON SUN, HP, OR DEC WORKSTATIONS



WANSTATION™ Features

- ***Integral Packaging*** - Installs within 5 1/4" disk bay
- ***Multiplatform Support*** - Sun, DEC, HP
- ***1 to 24 High-Speed WAN Ports per Host*** - One SCSI ID per four ports
- ***SCSI-Attached*** - Requires no internal bus slot
- ***Multiprotocol Communications*** - X.25, X.29 Terminal & PAD support, HDLC, DDCMP, ASYNC
- ***CCITT X.25 Levels 1, 2 and 3*** - Implemented in on-board firmware
- ***Standards Compliance*** - FED Std 104.1/FIPS 100, DDN X.25 Interface Standard Mode Operation, FIPS 78 Class Band Class C ADCCP
- ***Full Duplex Virtual Circuits*** - Up to 254 (SVCs and/or PVCs) per physical link
- ***Streams Support*** - For satellite and other nonstandard data transfer schemes
- ***Host Language Interface*** - For user customization
- ***Clock Rates*** - Up to 1.544 Mbps
- ***Data Rates*** - Up to T1 (receive only) Up to 700 Kbps (send and receive)
- ***Mode Types for I/O*** - DTE or DCE
- ***Data Packet Size*** - Up to 4 KBytes
- ***Control Selections*** - Fast Select Facility, Flow Control Negotiation, Extended Frame and Packet Sequencing, Selective Reject, Packet Level Options, Timers, Statistics, and Modem Control
- ***Modular Design*** - Can be tailored to the user's system requirements
- ***Rugged and Tempest Packages*** - Available for industrial and military use

8300 Guilford Road • Suite H • Columbia, MD 21046 — PH (800) 242-0739 • FAX (410) 290-810

CIRCLE 5 ON READER SERVICE CARD

Monterey Bay COMMUNICATIONS

Established 1977

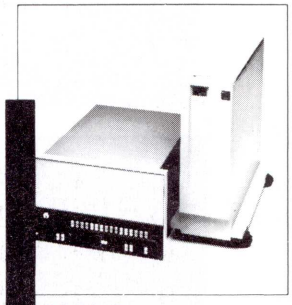
HP Remarketing Specialists

Monterey Bay Communications is a vendor of remarketed Hewlett-Packard equipment. Since 1977, we have worked exclusively with Hewlett-Packard products serving 1000, 3000, and 9000 Users nationwide. Our goal is to provide those users with reliable used equipment that is functionally and cosmetically identical to what HP offers and at substantial savings. We do this within a sales environment that minimizes problems of shipping, configuration and installation. Consider the following:

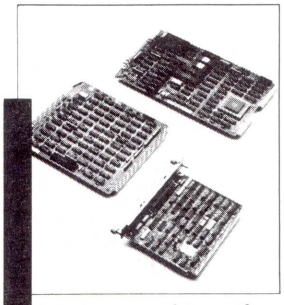
- **The *same* Hewlett-Packard equipment you are buying now at substantial savings.**
- **All equipment guaranteed for Hewlett-Packard maintenance.**
- **An extensive parts and spares inventory assures prompt delivery—overnight if necessary.**
- **Knowledgeable service from a company that has been in business for over a decade.**

Our customers are our best reference and your best guarantee of satisfaction...

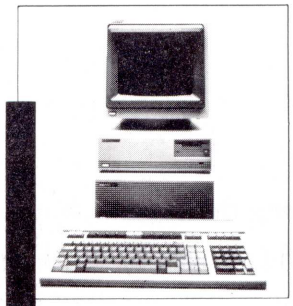
Aerojet Liquid	Allied Signal
Arco Chemical	Arinc Research
Bendix Eng.	Container Corp
Cummins NW	Cutter Labs
Harvard Observatory	Qume Corp
Proctor and Gamble	Rockwell Int'l
Smith-Kline	Spectra Physics
Stanford Labs	TransAmerica Corp
3-Com Corp	Tandon Magnetics
U.C.L.A.	U.S.D.A.
Warner-Lambert	University of Iowa



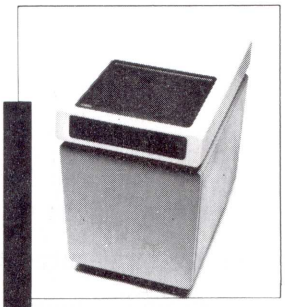
1000 Computers:
"A" Series, all models
"M, E, F" Series
Printers:
2225A/B/C/D
2631B/2635B
2932A/2934A
2563A,B/2564A,B
and more . . .



Memory and Interfaces:
"A" Series, all models
"M, E, F" Series,
2100 Series
80, 100 Series
200, 300 Series
and more . . .



9000 Computers:
80, 100 Series
200, 300 Series
Terminals:
262X Series
264X Series
700/XX Series
and more . . .



Disks and Tapes:

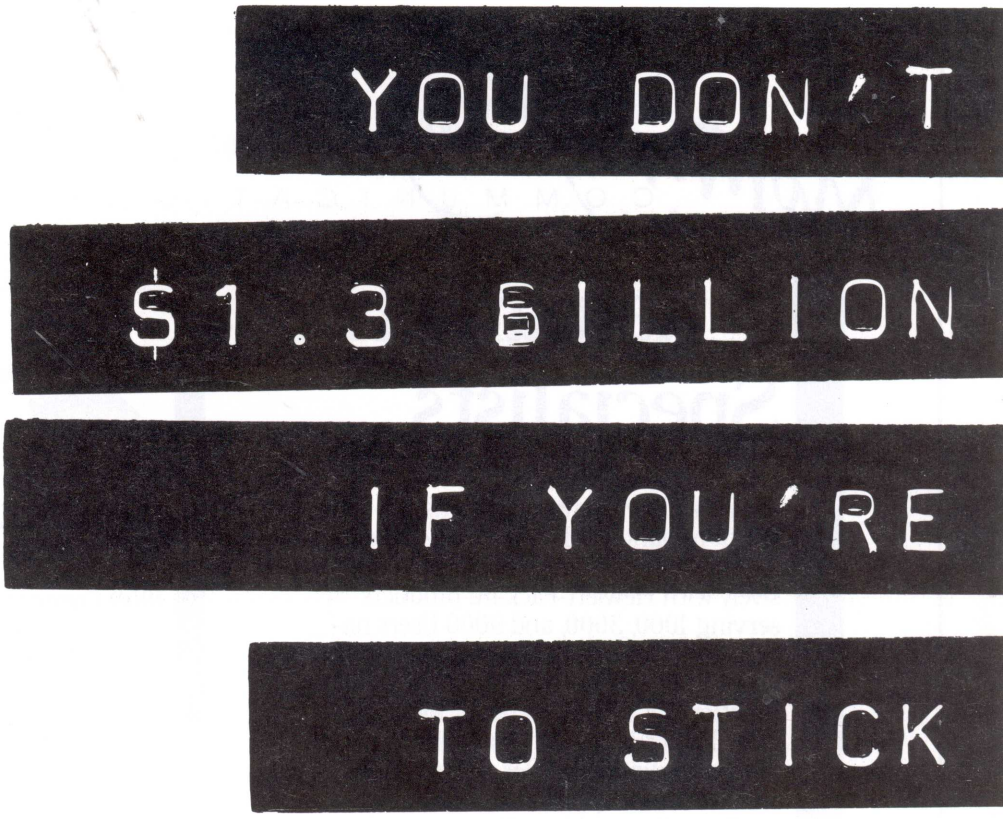
7905/06	9122/23
7920/25	9133/53
7908/11	9144/45
7912/14	7970/74
7945/46	7978/79/80
7962/63	7957/58/59

7937 and more . . .

Monterey Bay Communications
1010 Fair Avenue
Santa Cruz, CA 95060
408-429-6144
FAX 408-429-1918

We also purchase equipment . . .

CIRCLE 3 ON READER SERVICE CARD



This may be stating the obvious, but sometimes, it's worth stating the obvious. We've observed that the most successful companies out there—companies like Ford, AT&T, General Electric—have one thing in common.

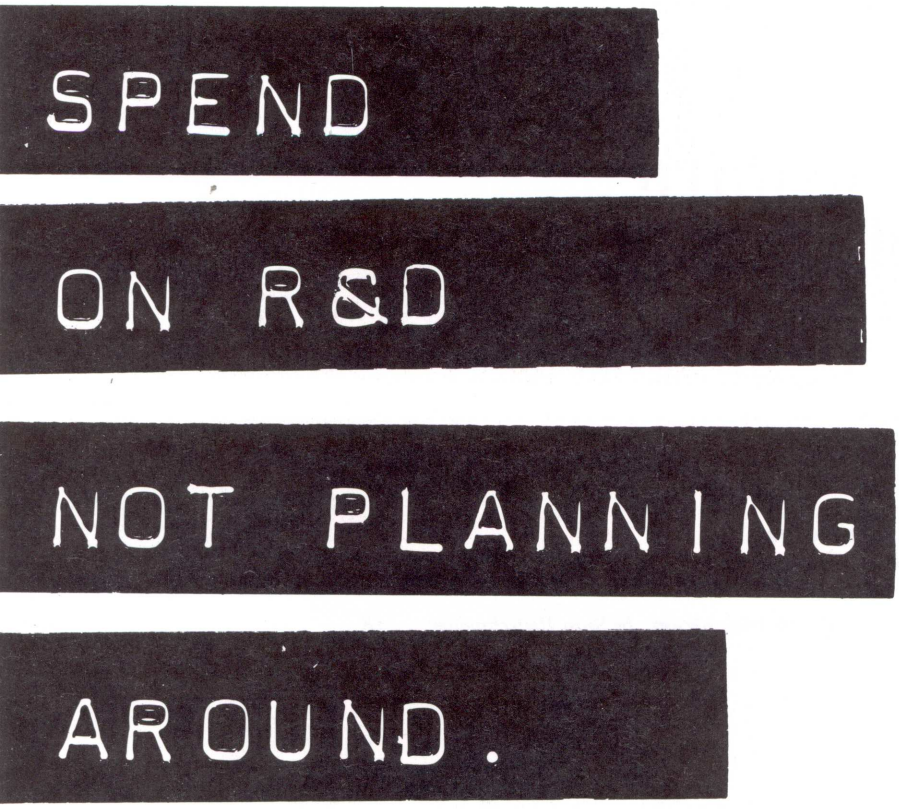
They believe in the future. And they put their money where their belief is.

Year in and year out, these companies are among the top 10 spenders on research and development. And on that same top 10 list, in the number 7 position, you'll find Digital. Our long-standing commitment to R&D (we spend more than Apple, Compaq and Sun combined) has led to the development of one breakthrough after another.

From the world's first 64-bit chip, Alpha, and the industry's fastest workstations and servers, to leading-edge software products such as LinkWorks,™ our award-winning groupware application.

From the highest-quality, most standards-compliant version of the UNIX® operating system, DEC OSF/1,® to OpenVMS,™ which meets the key standard of openness from X/Open,™ the nonprofit open standards consortium, not to mention groundbreaking video servers and other interactive information technologies.

JFN



These technologies are leading the way for everything from video-on-demand and home shopping to interactive education. Our commitment to R&D remains unchanged at Digital. What has changed is our way of going about it. It used to be that the hardest part of R&D here wasn't coming up with the ideas. It was pushing them through the system.

So, we've changed the system. From one of Byzantine complexity, to one of resolute clarity. What exists today at Digital is a system where the scientific and pragmatic go hand in hand. A system in which ideas are born and nurtured not just to promote innovation for innovation's sake, but rather, to help customers in real, meaningful ways.

What it all comes down to is this. Digital was, is and will continue to be one of the biggest proponents of research and development in the country. For one simple reason. We believe that investing in the future is the smartest way to secure your place there.

For more information, please call 1-800-DIGITAL or you can reach us via our Internet address: moreinfo@digital.com.

digital™

CIRCLE 14 ON READER SERVICE CARD

hp-ux/usr

Volume 3, Number 1 January 1995

Contents

Features

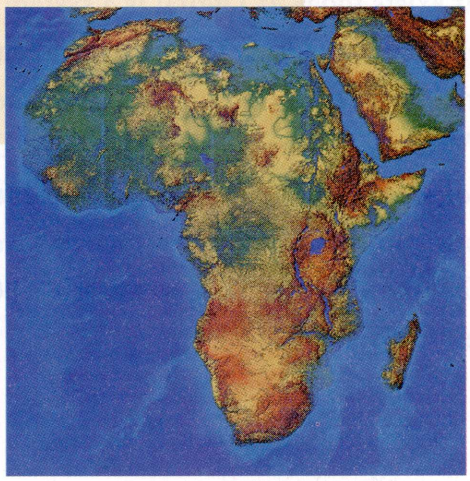
Page 38

Departments

Columns

New Products
See page 78

Cover Story:
See page 24



Lose your mouse and increase your productivity.

A Tired Hand Isn't A Productive Hand

Fingertip, Not Elbow Control If you're using a mouse, you're asking for trouble. The motions required to operate a mouse have been shown to cause severe fatigue and repetitive motion injuries. Injuries that can slow you down, and inflict permanent damage to your hand. Even if the repetitive motions in mouse usage haven't caused any injury in your case, they will definitely tire you out. That's why the MOUSE-TRAK® is designed to eliminate wasteful and tiring arm and wrist movements. The fingertip control of our trackball and input keys, and our elevated hand support can reduce fatigue and the risk of repetitive motion injuries. So don't get caught in the RMI trap (*Call our 800 number or contact us via Internet, and we'll send you a complete analysis of repetitive motion syndrome and why MOUSE-TRAK is superior to mice.)*

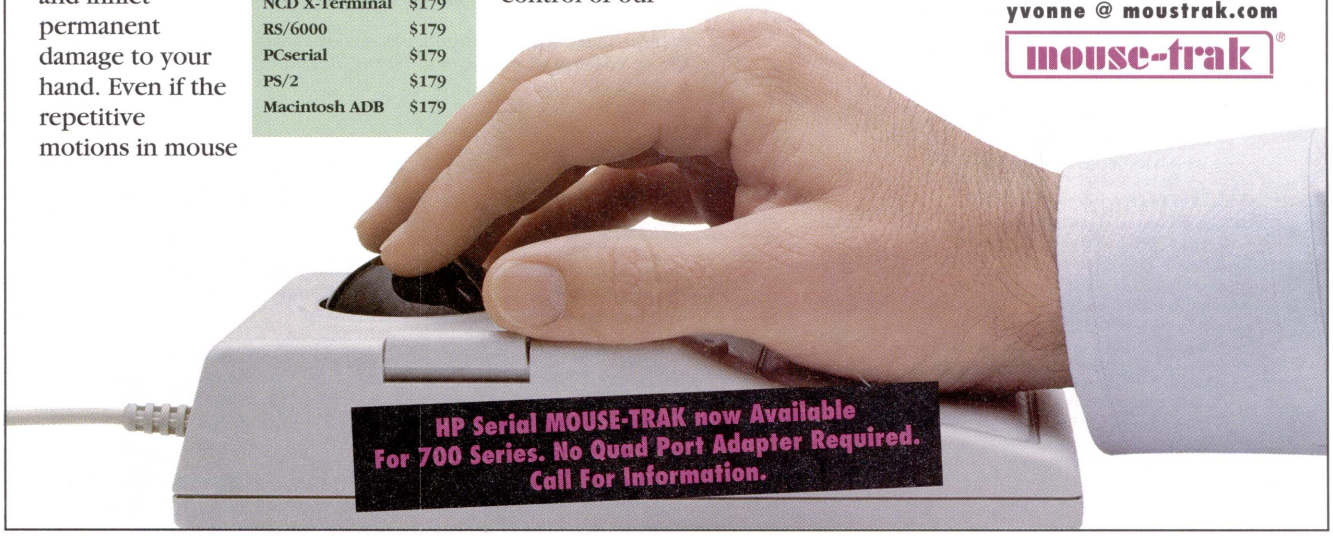
INDUSTRIAL MODELS	
HP/APOLLO	$295
SUN Sparc	$295
DEC	$295
Silicon Graphics	$295
NCD X-Terminal	$295
RS/6000	$295
PCserial	$295
PS/2	$295
Macintosh ADB	$295
PROFESSIONAL MODELS	
HP/APOLLO	$199
SUN Sparc	$199
DEC	$199
Silicon Graphics	$199
NCD X-Terminal	$179
RS/6000	$179
PCserial	$179
PS/2	$179
Macintosh ADB	$179

Industrial Model Available Our *Industrial* model has the same ergonomic design as the *Professional,* with heavy-duty features like a super-strong Xenoy thermoplastic case, shielded cable, and greater moisture resistance.

Lose Your Tiring Mouse and Increase Productivity To order your MOUSE-TRAK in the U.S.A. call:

1-800-533-4822
yvonne @ moustrak.com

mouse-trak®



ORDER TOLL FREE 1-800-533-4822

International MOUSE-TRAK dealers: **NTWare Ltd.** Pangbourne, Berkshire U.K. Tel: 0734 845792 • **Skrivervik Data** Oslo, Norway Tel: 47 2 18 58 00 • **The Chameleon Group** Dusseldorf 1, Germany Tel: 0211-379057 • **Datacomp** Dietikon, Switzerland 01 740 51 40 • **SC METRIC A/S** Skodsborgvej Naerum, Denmark Tel: 42 80 42 00 • **Guillevin** Mississauga, ONT Tel: 416 670 8433 • **Hypec Electronics** Ryde, Australia Tel: (02) 808 3666 • **SPECMA** Gothenburg, Sweden Tel: 031 89 16 00 • **Aurora Systems, Inc.** Seoul, Republic of Korea Tel: 718-4985 • **PHASELYS** Rosny Sous Bois, France Tel: 48.94.84.85 • **Seg Tec** Azur, Israel Tel: 972 3 556 7458 • MOUSE-TRAK is manufactured in the U.S.A. by ITAC Systems, Inc., 3113 Benton Street, Garland, Texas 75042 Fax: 214/494-4159 Patented by ITAC Systems, Inc. MOUSE-TRAK is a registered trademark of ITAC Systems, Inc. Other brand and product names are trademarks of their respective holders.

CIRCLE 78 ON READER SERVICE CARD

hp-ux/usr
A Publication of Interex®

hp-ux/usr is published bimonthly by Interex, the International Association of Hewlett-Packard Computing Professionals. Third-class postage paid at Sunnyvale, California 94086 and additional offices. The editorial and business offices are located at 1192 Borregas Ave., Sunnyvale, California 94089, USA, 408.747.0227, Fax 408.747.0947. Address membership questions and change of address to Membership Services. Address all questions concerning circulation/distribution to the Distribution Manager.

Remittances should be sent to Interex, File No. 61054, P. O. Box 60000, San Francisco, California 94160, USA.

Address all editorial correspondence to Michael Ehrhardt, Editor, *hp-ux/usr* Magazine, c/o Interex, P.O. Box 3439, Sunnyvale, California 94088-3439, USA.

Member Services (Site or General) include a subscription to *hp-ux/usr*. For other Member Services refer to membership form.

POSTMASTER: Send address changes to: Interex, P.O. Box 3439, Sunnyvale, California 94088-3439 USA. Attention: Member Services.

Bulk rate U.S. postage paid
Senatobia, MS . PERMIT # 30

How to Contact Interex...

EDITORIAL SUBMISSIONS

hp-ux/usr encourages readers to contribute their opinions, tips, and solutions. When sending letters for publication or to request author contribution guidelines, please address them to *hp-ux/usr* editor Michael Ehrhardt.

Postal Address:
Interex
P.O. Box 3439
Sunnyvale, CA 94088-3439

Office Address:
1192 Borregas Avenue
Sunnyvale, CA 94089

Because of the difference in zip codes between our office address and P.O. Box, please be sure to address all regular mail to the P.O. Box. Any express service packages should be delivered to the Borregas Avenue address. Thank you for your attention to this small but significant detail.

TELEPHONE:

The Interex switchboard is open 8:00 a.m.–5:00 p.m., Pacific Time. Call 800.468.3739 (U.S. and Canada) or 408.747.0227. After 5:30 p.m. our voicemail system will record your call.

FACSIMILE:

Call 408.747.0947

INTERNET:

To send e-mail to Interex, use the following address format:
<IDname>@interex.org
The following IDs are currently active on Interex's HP 9000:

ID	Department
ehrhardt	*hp-ux/usr* Letters to the Editor, Q&A, and requests for author guidelines
postmaster	Internet support
cslhpux	Contributed Software Library
membership	Membership/subscription inquiries and services
pubs	Circulation and advertising inquiries
conference	Conference questions and arrangements

An example would be ehrhardt@interex.org
Anything before the @ sign is case insensitive.

COMPUSERVE:

Interex can be contacted via the CompuServe ↔ Internet gateway. To send CompuServe mail, use the following format:

>INTERNET: ehrhardt@interex.org

You can address your mail to specific departments using the ID's listed above.
Interex maintains a CompuServe account that is collected daily. Please address all messages to ID no. 76376, 1222.

interex

Shared Knowledge.
Shared Power.

As a not-for-profit association of HP computing professionals, Interex is dedicated to meeting the information, education, and advocacy needs of its members worldwide.

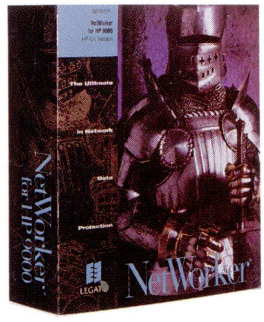
In today's world of rapidly changing technology, Interex puts hands-on solutions to hardware, software, and operating system problems at your fingertips. Because members actively contribute—exchanging ideas and sharing solutions—Interex is a vital link in the transfer of HP expertise.

Operating independently from Hewlett-Packard, Interex has more than 20 years of serving HP computing professionals. Through its publications, conferences, and volunteer committee structures, Interex has the qualifications to represent you, a valuable member of the HP user community.

Come Out of the Dark Ages

v 4.02 Now Available

Protecting valuable information has always been an important job. Today however, as in times of old, this task has too often been accomplished using methods which are outdated and inadaquate.



NetWorker for HP 9000 from INNOVUS provides a modern solution to an age old problem.

NetWorker is the industry standard backup and restore solution for UNIX networks. NetWorker combines flexibility, scalability and ease of use to provide a complete backup solution in an open client/server environment.

Supported platforms include NetWare, DOS, and most versions of UNIX. With NetWorker for HP 9000, data protection of legendary proportions can now be yours, today.

Contact an authorized reseller or INNOVUS at,
Voice: (905) 529-8117,
Fax: (905) 572-9586,
E-Mail: infonwr@innovus.com.

HEWLETT PACKARD
Premier Solution Partner

LEGATO NetWorker® Solutions Partner

INNOVUS Inc.

CIRCLE 136 ON READER SERVICE CARD

Question & Answer

Q: Where is traceroute for HP-UX?

A: Starting with HP-UX 8.0, the feature 'record route' was added to the */etc/ping* command. From the man page for ping:

> Insert "record route" IP option in outgoing packets, summarizing routes taken when the program exits. It may not be possible to get the round-trip path if all hosts on the route taken do not implement the "record route" IP option. A maximum of nine Internet addresses can be displayed due to the maximum length of the IP option area.

Here are examples of local, adjacent, and Internet ping traces. In the first two examples, a packet size of 64 and one ping have been specified:

LOCAL:

```
# ping -o hpuerca 64 1
PING hpuerca.atl.hp.com: 64 byte packets
64 bytes from 15.17.184.29: icmp_seq=0. time=4. ms
----hpuerca.atl.hp.com PING Statistics----
1 packets transmitted, 1 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 4/4/4
1 packets sent via:
        15.597.184.29     - hpuerca.atl.hp.com
        15.597.184.24     - hpuerci.atl.hp.com
```

ADJACENT:

```
# ping -o s3109b23 64 1
PING s3109b23.atl.hp.com: 64 byte packets
64 bytes from 15.41.40.87: icmp_seq=0. time=4. ms
----s3109b23.atl.hp.com PING Statistics----
1 packets transmitted, 1 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 4/4/4
1 packets sent via:
        15.414.40.1       - [ name lookup failed ]
        15.414.40.87      - s3109b23.atl.hp.com
        15.17.184.454     - atl-e2-gw.atl.hp.com
        15.17.184.724     - hpuerci.atl.hp.com
```

LIE BACK WHILE YOUR NETWORK BACKS UP.

Now, you can relax with IEM and Alexandria. Alexandria is designed to supervise every facet of your UNIX network backup. So, while you are taking it easy, Alexandria will:

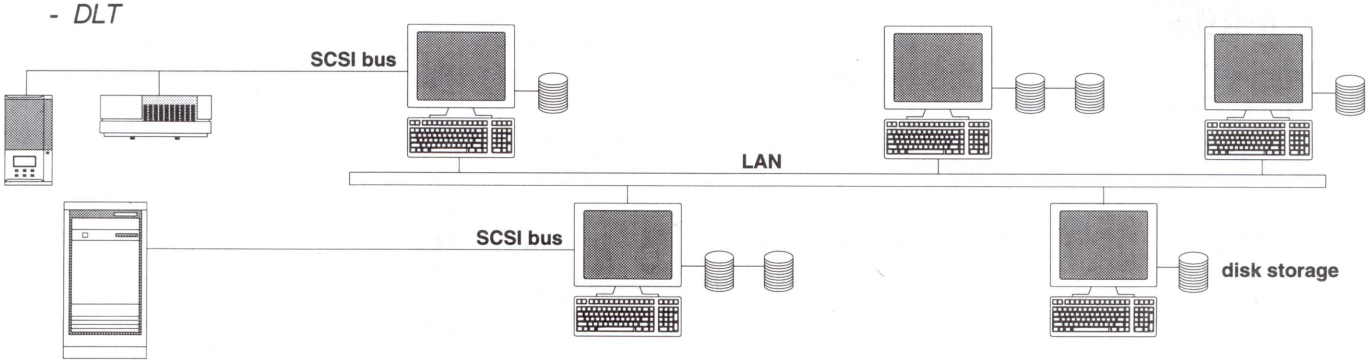
- **Work 24 hours a day, 7 days a week, and never take vacation.**
- **Organize and automate your system backups and archives.**
- **Manage all of your backup media — including optical.**
- **Back up your entire network — even if it consists of several UNIX platforms.**
- **Work with IEM's 4mm and 8mm carousels and autofeeders as well as HP's optical libraries.**

Backup Devices
Drives, Autofeeders, and Jukeboxes

- *4mm tape*
- *8mm tape*
- *3480 tape*
- *Optical disk*
- *DLT*

Alexandria Servers
HP 9000 700/800 and non-HP UNIX-based machines

Alexandria Clients
HP 9000 300/ 400/ 700/ 800 and non-HP UNIX-based machines



IEM specializes in HP-compatible solutions. For more information on IEM products, please contact us at one of the numbers below.

In the U.S. and Canada:
IEM, Inc., P.O. Box 1889
Fort Collins, CO 80522 USA
Phone: (303) 221-3005
(800) 321-4671
Fax: (303) 221-1909
E-Mail: info@iem.com

All Others
IEM International Sales
1629 Blue Spruce Drive
Fort Collins, CO 80524 USA
Phone: +[1] 303-221-3005
Fax: +[1] 303-221-1909
E-Mail: info@iem.com

CIRCLE 157 ON READER SERVICE CARD

OPEN INTERNET:

```
# ping -o interex.org 64 3
PING interex.org: 64 byte packets
PING interex.org: 64 byte packets
64 bytes from 198.151.251.2: icmp_seq=0. time=212. ms 64 bytes
from 198.151.251.2: icmp_seq=1. time=198. ms 64 bytes from
198.151.251.2: icmp_seq=3. time=180. ms
----interex.org PING Statistics----
3 packets transmitted, 3 packets received, 25% packet loss
round-trip (ms)  min/avg/max = 180/196/212
3 packets sent via:
        15.324.248.6      - atl1gw.atl.hp.com
        15.414.112.2      - atlhgw5.cns.hp.com
        15.900.200.193    - palhgw1.cns.hp.com
        15.0.812.3        - ncchgw3.corp.hp.com
        192.407.201.33    - hpl-ext.hpl.hp.com
        131.119.251.198   - HP.BARRNET.NET
        131.119.13.1      - [ name lookup failed ]
        131.119.74.25     - FHDA.BARRNET.NET
        156.151.254.1     - barrnet-gw1.inet.portal.com
```

The trace shows the route that each packet took to travel through the network. (For the nitpickers, some of the addresses have been changed for security reasons).

Q: I have IDMERR* files showing up all over my system. Why is this happening?

A: Files with the prefix: IDMERR are showing up in many directories. The content appears to be in German as in:

```
[E: Keine Methode, image OBAM_DLG.ErrorWindow.ErrorImage anzulegen]
```

At 9.0, the primary interface to SAM was changed but as a side result, files with the name IDMERROR* are placed in various working directories. An SR has been filed, but in the meantime, the following workaround will eliminate the files:

```
find  / -fsonly hfs  -name  "IDMERR*"  -exec rm {} \;
```

which should be placed in the root *crontab* file, to be run during off-hours, since it will search the entire filesystem (not NFS or cdfs). The problem has been traced to the TOOLS fileset and can be fixed by reloading the SAM fileset from the CORE tape or CD-ROM.

Q: How do you read the contents of a *cronlog* file?

A: Here is an example cron file:

```
! *** cron started ***   pid = 160 Tue Jul 19 15:22:52 EDT 1994
>  CMD: /usr/sam/bin/br_backup DAT PART Y /dev/rmt/c201d1c /usr/sam/c...
>  root 1642 c Thu Jul 21 11:00:23 EDT 1994
<  root 1642 c Thu Jul 21 11:00:37 EDT 1994 rc=2
```

> or < is start/stop indicator respectively.
Next is user, then process id.
Then cron event type (c=cron, a=at), followed by time.
rc=2 is the return code (in the above case, 2 is the errno value, which, being non-zero, means that the command failed—no tape in drive).

Q: My new system was booted by an inexperienced user who did not answer the questions about networking and time zone. How can I restart my new system so it will go through these questions?

A: Bring the system into single user mode with

```
shutdown  0
```

and once the system stops at the shell prompt, type the command

```
/etc/set-parms
```

This is the process that asks about networking and time zones.

Q: How can I create a zero-length (empty) file in HP-UX?

A: There are five (maybe more) ways from a shell prompt:

- `> file_name`
- `cat /dev/null > file_name`
- `cp /dev/null file_name`
- `touch file_name`
- `vi file_name [and immediately :wq!]`

The first simply redirects *stdout* into the file. In this context, *stdout* is zero length and thus creates the file with no data. The second and third methods use */dev/null* (a zero-length source device) to feed into the file. The touch command creates files if they don't exist and vi creates a zero length file if there are no lines in the buffer when it exits.

Q: How can I put control characters and escape sequences in a file using the vi editor?

A: The secret is to use CTRL-V as a flag to vi that says: the next character is a special character and to escape any meaning it may have to vi. So, to put an escape character into a file:

i	(insert mode)
CTRL-V	(will place the ^ character inline)
ESC	(press the escape key)
ESC	(press it again to exit insert mode)

You will now see ^] which is vi's way to show CTRL-]—the ESC key. To differentiate between the escape character and the two ordinary characters ^], just space over the characters and see if the cursor jumps over the ^ character. If it does, then the two characters really represent the corresponding single control character. See also vis and inv, two commands that can help with editing control characters.

Q: How does the */etc/securetty* file work?

A: Root access can be denied to any port on the system by the use of the */etc/securetty* file. If not present (the default), anyone who knows the root password can log in as root regardless of his location (modem, DTC port, tty port, network login). However, if the */etc/securetty* file contains

```
console
tty0p4
tty1p2
```

then root logins will fail ("Login incorrect") if the user is not on one of the three ports listed in the above example. If the word console is not in the */etc/securetty* file, root login at the console is disabled! Any attempt by someone on port tty0p1, etc., will also fail, even though the correct password has been supplied.

This file should be created with caution. If the file has no valid port names, including console, root access is denied to *ALL* users! There is no fix for this condition except:

1. log in as a normal user and use the *su* command to attain root status
2. reboot in single user mode (600, 700, 800 only) or use the recovery system (300, 400).

To protect */etc/securetty* from user access, be sure to set the owner to root and bin, and the permissions to 600 (rw for owner only).

Q: How can I eject a DDS tape from a script? I would like to do this in order to prevent other programs from writing on the tape.

A: The command

```
mt -t /dev/<tape_device> offline
```

will cause the tape to be ejected—except for HPIB drives. In the HPIB tape drives, there were two forms of behavior:

> ...When set to address 8 (a special address that is really HPIB-3), the drive would emulate a 7980A tape drive. This was implemented in order to allow older opsystems without full DDS support to work with the DDS tape drive. In this case (HPIB address 8), the drive will go offline (the lower green light will go off) but the tape will stay in the drive.
>
> Being offline will not allow the tape to be accessed, so other than the tape not being physically ejected, this will prevent further access.
>
> ...For any HPIB address from 0 through 7, the tape will be physically ejected.

All SCSI tape drives will eject the tape. The mt(1m) command assumes that the tape device file is named: */dev/rmt/0m*, much like tar(1). So, if the name of the tape drive is */dev/rmt/0m*, the command: `mt offline` will suffice.

In all cases, the error message:

```
mt lu 0: No CLOSE operations performed due to OFFLINE.
```

will occur on Series 800 computers since the drive will be offline as the system call finishes. This is a normal message and can be ignored. There is no: mt OFFLINE message from 300/400/700 workstations.

Q: I need to know what all the parameters are for the tftp files found in */usr/tftpdir/hpnp* for JetDirect cards.

A: For HP JetDirect printers, detailed information for use in network management can be downloaded using tftp facilities. The directory where the configuration files are stored is: */usr/tftpdir/hpnp* and the files are *<printer_name>.cfg*.

The format is:<item>: value

The order of the items in the file is not important. The # character is a comment, so it should not be used.

Here are the items available:

MDL Corporation does it again!

HP9000/7XX Driver for the Seagate Elite 9GB disk drive

Other products manufactured by **MDL** include

FAWS
Fast and Wide SCSI controller

FANS
Fast and Narrow SCSI controller

EISA BUS Expansion Box

Full function Exabyte drivers for the HP-UX and Domain operating systems

Performance tuned drives

Now thanks to **MDL** you can run the **Seagate Elite 9®,** 5.25" 9GB formatted Fast SCSI 2 drives on your **HP System**. Think of the possibilities with a complete 9GB subsystem, drivers, tested and custom configured for optimal performance.

Call MDL at (800) 800-3766

Seagate

Seagate and Elite are registered trademarks of Seagate Technology, Inc.

Fax (206) 861-6767 Call TODAY

CIRCLE 170 ON READER SERVICE CARD

```
name: test14   location: Building 34, post J.14
contact: Mortimer Snerd, x1234
allow: 15.0.1.2
get-community-name: test1
set-community-name: test2
trap-dest: 15.0.2.3
```

For 'allow', two params are available: host-name and, optionally, subnet mask. The form would be:

```
allow 15.2.3.4  255.255.248.0
```

The subnet mask should correspond to the mask used on the network with the 'allow'ed host, not the network with the JD card, unless they are the same.

```
name
location
contact
allow
get-community-name
set-community-name
trap-dest
```

Q: How can I restrict usage of ftp into a particular system?

A: The *ftpusers(4)* file will do this. It does exist by default but provides the following ability:

> ftpd rejects remote logins to local user accounts that are named in */etc/ftpusers*. Each restricted account name must appear alone on a line in the file. The line cannot contain any white space. User accounts that specify a restricted login shell in */etc/passwd* should be listed in */etc/ftpusers* because ftpd accesses local accounts without using their login shells. UUCP accounts should be listed in */etc/ftpusers*. If */etc/ftpusers* does not exist, ftpd skips the security check.

Here is an example:
Given an */etc/ftpusers* file containing the following:

```
uucp
guest
# This is a test
billh
```

ftpd would reject login attempts using the local accounts billh, uucp, or guest. In this case, the line # This is a test" is ignored because the first word is not a valid user on the system.

Q: One of my programs is failing with errors that indicate not enough memory is available. What can I do to fix this?

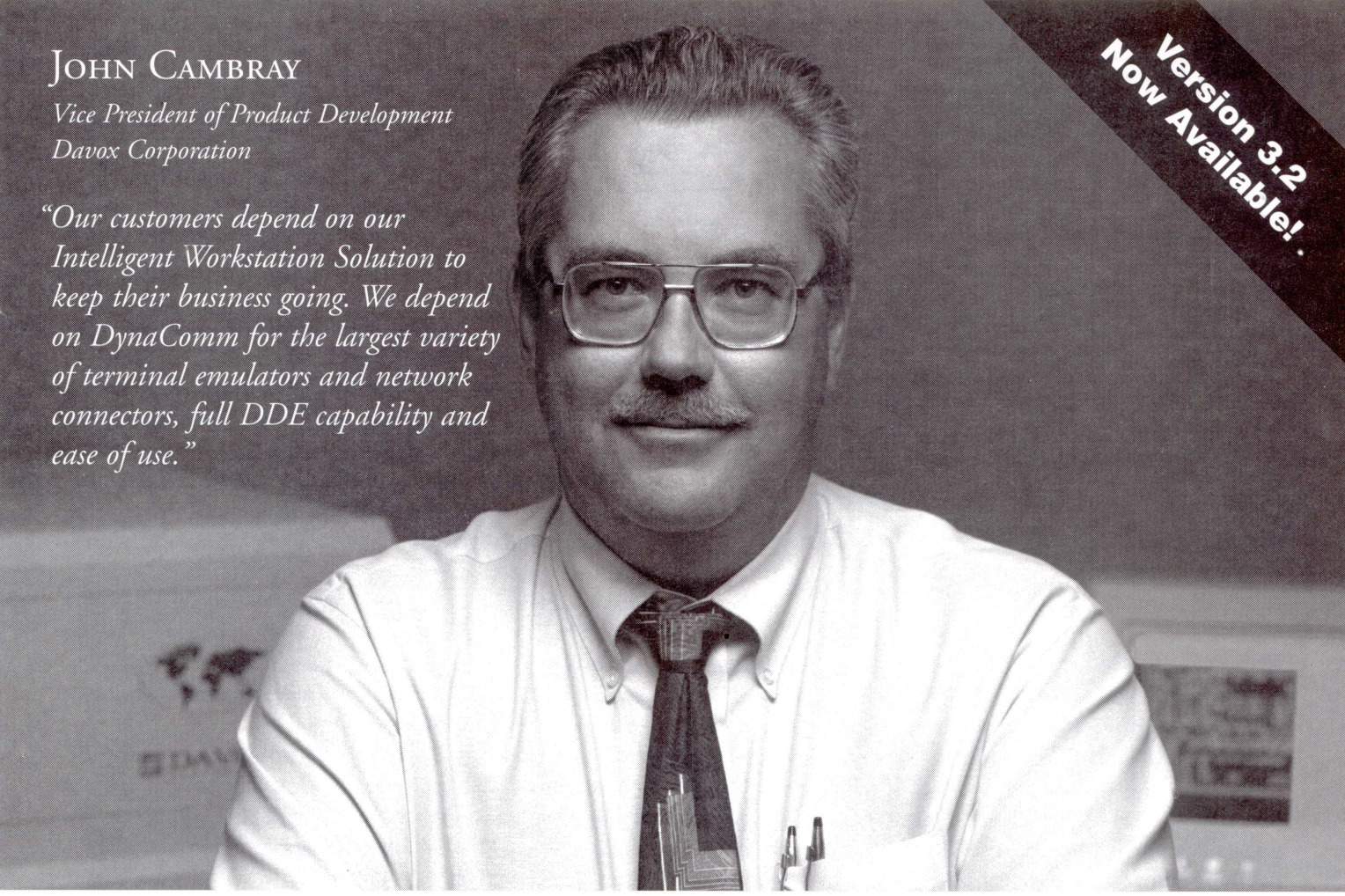
A: Actually most errors relating to memory space (malloc failed, ENOMEM or errno 12, program too big, etc.) are related to two different parts of the memory system: swap space and partition limits.

Swap space is all that HP-UX knows about when accommodating a new program or changes to the size of a program. The virtual memory system always allocates the needed swap space plus a predicted growth space known as reserved or hold area. Swap space is not added to RAM; instead, the RAM is a special case for swap and processes are moved into RAM when there is enough space and priority for RAM to be used.

Thus, if you have 50 megs of swap and 128 megs of RAM, you will not use more than 50 megs of RAM...the rest is essentially unusable because the virtual memory system only sees 50 megs of swap space. Note that at 9.0, changes were made to make use of a pseudo-swap reservation feature (Series 800 only) that allows up to 3/4 of available RAM to be used for virtual memory mapping. See the *How HP-UX Works: Concepts for the System Administrator* manual.

/etc/swapinfo is useful for monitoring swap usage. The hold value is the reserved area that isn't occupied but held in reserve in case it may be needed. If you need additional space, look at the swapon(1m) command for ways to use the filesystem as additional temporary swap space.

The other reason for no memory is partition sizes for data, stack, and so on. The values shipped with HP-UX are for typical systems, but you definitely will have to increase maxtsize, maxdsize, and maxssize if you run very large programs. SAM can adjust



DynaComm delivers for Davox.

Davox Corporation is a worldwide provider of unique, unified solutions for customer contact operations.

At FutureSoft, we know that PC connectivity has become a critical component in enterprise-wide computing. Our DynaComm product family provides extensive terminal emulation and network connectivity solutions for both asynchronous and IBM mainframe environments.

Take advantage of over a decade of experience and discover what Davox, Thoroughbred, Digital, Hewlett-Packard and numerous Fortune 500 companies already know.

Our latest version has all the features that serious computing environments demand:

◆ Optional support for Microsoft's Visual Basic ◆ User desktop tools which are easy to configure and support ◆ Selective, DLL-based installation on your PC or server to minimize application footprint ◆ Graphical tools including dialog editor and keyboard mapper for easy interface customization ◆ Scripting capability to call external DLLs which is unequalled in the industry

Call for a free DynaComm demo disk.

1-800-989-8908

DynaComm by **FutureSoft**

The Ultimate in Power and Flexibility

FutureSoft • 12012 Wickchester Lane, Suite 600 • Houston, Texas 77079 • 713.496.9400 • FAX 713.496.1090 • Nijverheidsstraat 12 • 2288 BB Rijswijk • The Netherlands • 31.70.390.7727 • FAX 31.70.390.7005

CIRCLE 48 ON READER SERVICE CARD

this value for you, but you will have to reboot the system once the new kernel is rebuilt.

General HP-UX and 9000 questions are answered by Bill Hassell, a support engineer at the HP Atlanta Response Center. He can be contacted via e-mail at blh@hpuerca.atl.hp.com.

Workstations

Q: I have a ROCKY MOUNTAIN BASIC/UX program that I used to run on a HP 9000 Series 300 at HP-UX 7.0 and BASIC/UX 5.52. The code ran fine until I updated my systems to HP-UX 9.0 and BASIC/UX 6.3. Now when I try to run the same code, I get an out of memory error. I have configured BASIC/UX 6.3 for 6 megabytes of workspace, which is what I used back at BASIC/UX 5.52, and the machine has 16 megabytes of RAM. Why am I getting an error and how do I correct it?

A: There have been many changes and enhancements between the 5.52 and 6.3 versions of BASIC/UX. I suspect that due to these changes, the workspace requirements for your program have slightly exceeded the 6-megabyte workspace limit. To correct the problem, I suggest that you increase the *shmmax* kernel parameter. The *shmmax* kernel parameter defines the maximum size of a shared memory segment of a process.

The BASIC/UX workspace cannot exceed the *shmmax* setting and the default size of the *shmmax* on an HP 9000 300 Series machine is 6 megabytes. Increasing *shmmax* and rebuilding your kernel will allow you to increase your BASIC/UX 6.3 workspace as needed to clear the error.

Q: I have a network set up with seven HP 9000/382s and five older HP 9000/350 computers. I use one HP 9000/382 as my SRMUX server. It is running HP-UX 9.0 and SRMUX revision A.01.03. The other machines are booting BASIC/WS 6.21 from the SRMUX server and collecting data that is then stored back down to the SRMUX server. I have configured the SRMUX clients exactly as shown in the *SRM/UX System Administrator's and Users Guide.* My problem concerns recovering files from a backup.

We experienced a power failure recently which corrupted the server's file system. I restored the server's filesystem from a backup made earlier in the week. The backup restored the BASIC/WS 6.21 programs and data file as I expected; however, the file ownerships and groups were all wrong. The restored BASIC/WS files under the SRM/UX directory structure were restored with root as the owner and sys as the group. This took me some time to correct. I went back to the SRM/UX documentation to ensure that I had set up the clients correctly. Each machine had an entry in the */etc/srmdconf* file with its own unique Uid (user id) and all were configured with the same Gid (group id).

I experimented with backing up and recovering test directories and the results are always the same. The files were restored with root as the owner and sys as the group. Why are the files not restored with the ownerships set up in the *srmdconf* file of SRM/UX?

A: To explain why you are unable to restore the SRM/UX files with the correct ownerships, we must look at how the SRM/UX server sets Uid and Gid vs. the HP-UX operating system. First, when a client machine boots BASIC/WS via an SRM/UX server, the srmd daemon checks the */etc/srmdconf* file to see if a client with the particular Link Level Address is configured to boot from the server. If so, then the client boots and the srmd daemon uses the Uid and Gid configured in the *srmdconf* file to control ownership and access to files under the SRM/UX directory tree.

The BASIC/WS client knows nothing about HP-UX uids and gids; it is a stand-alone operating system communicating with the srmd daemon when it needs files access or file storage space. The srmd daemon interacts with the HP-UX operating system. In contrast, the HP-UX operating system looks at the */etc/passwd* file to allow a user to log in and assigns the Uid and Gid configured there to that user for control of file access and ownership. The */etc/group* file is also used to define further the groups configured in the *passwd* file. The HP-UX backup utilities do not know about SRM/UX and do not look at the *srmdconf* file as they restore files.

The backup utilities look at the */etc/passwd* and group files to see if the owners saved on the backup are allowed on the system. When the utility does not find the particular user and

group on the system, it uses the Uid and Gid for root as the owner of backup process.

To correct this problem you will need to add the SRM/UX clients to the */etc/passwd* and group files as follows:

(example section of */etc/srmdconf*)

```
|Client     |      |      |      |Volume
|Name       | Uid  | Gid  |Umask|List
--+----------+------+------+------+-----
  : slim      :102   :   9   : 002 :SRMUXROOT # Bob's hp9000s332
  : dmace     :201   :   9   : 002 :SRMUXROOT # Bill's hp9000s382
  : dbasic    :217   :   9   : 002 :SRMUXROOT # Tester hp9000s382
```

(entries in the */etc/passwd* file)

```
slim:*:102:9: Bob's SRMUX client :/srmuxroot:/bin/sh
dmace:*:201:9: Bill's SRMUX client:/srmuxroot:/bin/sh
dbasic:*:217:9: Tester SRMUX client:/srmuxroot:/bin/sh
```

"*" prevents login see passwd(4)

(entry in the */etc/group* file)

```
srmux::9:dbasic,basic,slim
```

Q: I have an HP 9000 Series 745I running HP-UX 9.03 and HP VEETEST B.00.01. I would like to know how to access the serial ports on the 745I from VEETEST?

A: Access to the serial ports from HP VEETEST on the HP 9000 Series 700s is controlled by SICL (Standard Instrument Control Library). To gain access to the ports you will need to edit the */usr/pil/etc/hwconfig.cf* file and uncomment the lines that reference the serial interface. (see example hwconfig.cf section below):

```
# The serial drivers specify the following defaults:
# baud: 300 1200 2400 4800 9600 19200
# parity: NONE  0x00
#         ODD   0x08
#         EVEN  0x18
#         ZERO  0x38
#         ONE   0x28
```

```
# cbits: 7   0x02
#        8   0x03
# sbits: 1   0x00
#        2   0x04
# flow: NONE       0x00
#       XON_XOFF   0x01
#       RTS_CTS    0x02
#       DTR_DSR    0x03
# SRQ: RI    0x00
#      DSR   0x01
#
#Example:
#9 serial serial700 0xf0823000 26 <baud> <parity> <cbits>
#                                          <sbits> <flow> <SRQ>
 9  port_A serial700 0xf0823000 26 9600 0x00 0x03 0x00 0x00 0x00
#10 port_B serial700 0xf0822000 25 9600 0x00 0x03 0x00 0x00 0x00
```

After uncommenting the line above that references port A, you will need to run */usr/pil/bin/pilconf,* which will rebuild your kernel and set up the serial interface for use by VEETEST through SICL. Then you can access the serial port through a Direct I/O object. *A Word of Caution:* once you have configured port A for use by VEETEST as shown above, it is lost to the operating system for use as a standard serial port.

Q: I have an HP 9000 Series 725 running HP-UX 9.03 and BASIC/UX 7.0. I see in the *Installing and Maintaining BASIC/UX* manual that it is possible to map MSVS (Mass Storage Volume Specifier) through a statement in the *.rmbrc* file. I would like to know if it would be possible accidentally to INITIALIZE my HP-UX hard drive if the *.rmbrc* file contained the following lines:

```
10 ! DISK 1400 = /dev/rfloppy/c201d0s0
20 ! DISK 1406 = /users/customer/rmbfiles
```

and in my rmbux session, I accidentally executed the command:

```
INITIALIZE ":,1406"
```

instead of the correct command to INITIALIZE the floppy:

```
INITIALIZE ":,1400"
```

Would the hard drive be reformatted ?

A: No, it would not. The *HP BASIC Language Reference* manual (p/n 98616-90201) states on page I-23 under the paragraph titled "HP BASIC/UX Specifics":

"Only an unmounted disk may be initialized, in LIF format."

The attempt to INITIALIZE a mounted file system will result in the RMBUX error:

```
ERROR 52 Bad mass storage volume spec
```

Q: I have an HP 9000 Series 715 running HP-UX 9.03 and BASIC/UX 7.0. When I STORE or RESTORE programs in RMBUX on the 700 the file type listed after a CAT is PROG2 vs. PROG, which I am used seeing. I have some HP 9000 Series 382s on my network running BASIC/UX 6.3 that I would like to share programs with, but they will not load PROG2 files. My question is, What are PROG2 files and how can I move programs developed on my 715 over to the 382s?

A: The PROG2 file format is new with BASIC/UX 7.0. The reason for the new PROG2 format is several enhancements to BASIC/UX enabling the version to run on the Series 700 boxes. These enhancements have to do with line numbers, variable names, and line labels. On the Series 300 platform and BASIC/UX 6.3 and before, RMBUX was limited to 32,766 line numbers. As of BASIC/UX 7.0, a program can have up to 2 billion line

numbers. Also new with BASIC/UX 7.0 is the ability to have millions of variable names and line labels. The limit was about 7,200 in the earlier versions. These enhancements prompted the creation of the PROG2 file format because loading a PROG file with the new enhancements would result in a error on earlier versions.

To share files with the earlier versions running on your HP 9000 Series 382s, just use the SAVE or RE-SAVE command. This will save the program down as an ASCII file that will load fine on the earlier RMBUX as long as none of the old limits is crossed. ◧

Rudy Stanley answers workstation questions. He is an applications support engineer with the Hewlett-Packard Response Center in Atlanta, Georgia. He can be reached at brst@hpuerca.atl.hp.com.

HP 1000 GURU

Q: If a program is scheduled to run at an absolute start time, and then to run at a relative offset of, say, once an hour, resetting the system time sometimes changes the absolute start time, and sometimes not. What is going on here?

A: If one changes the system time *prior* to the *first* execution of the program, the program's *absolute* scheduled runtime is *not* altered. Subsequent to the first execution, the program is now scheduled to run every hour, *relative* to the first execution. If the system time is now changed, the relative runtime is maintained at one hour, thus the absolute runtime is altered to maintain the one-hour offset. The system determines whether a program is scheduled *absolutely* or *relatively* by examining bit 15 of word 18 of the ID segment.

The following example shows what is happening:

```
Program                 DataPartition CodePartition
Name   Prio   PC   Seg  Size Status   Size Status  Program Status
-------------------------------------------------------------------
Session  70  Superuser WALT
CI       51 17722c   1    26 in         51 sh      waiting for WH
        Shared EMA used: Environment 70
WH        5 12323          18 in                   scheduled
TEST      5     0          18                      dormant
         Will run in   6 minutes at 10:00:00:000 AM, every hour.
-------------------------------------------------------------------
Wed Oct  5, 1994   9:54 am
```

TEST has been scheduled to run at 10 a.m. exactly and then every hour thereafter. If we change the system time before 10 a.m.:

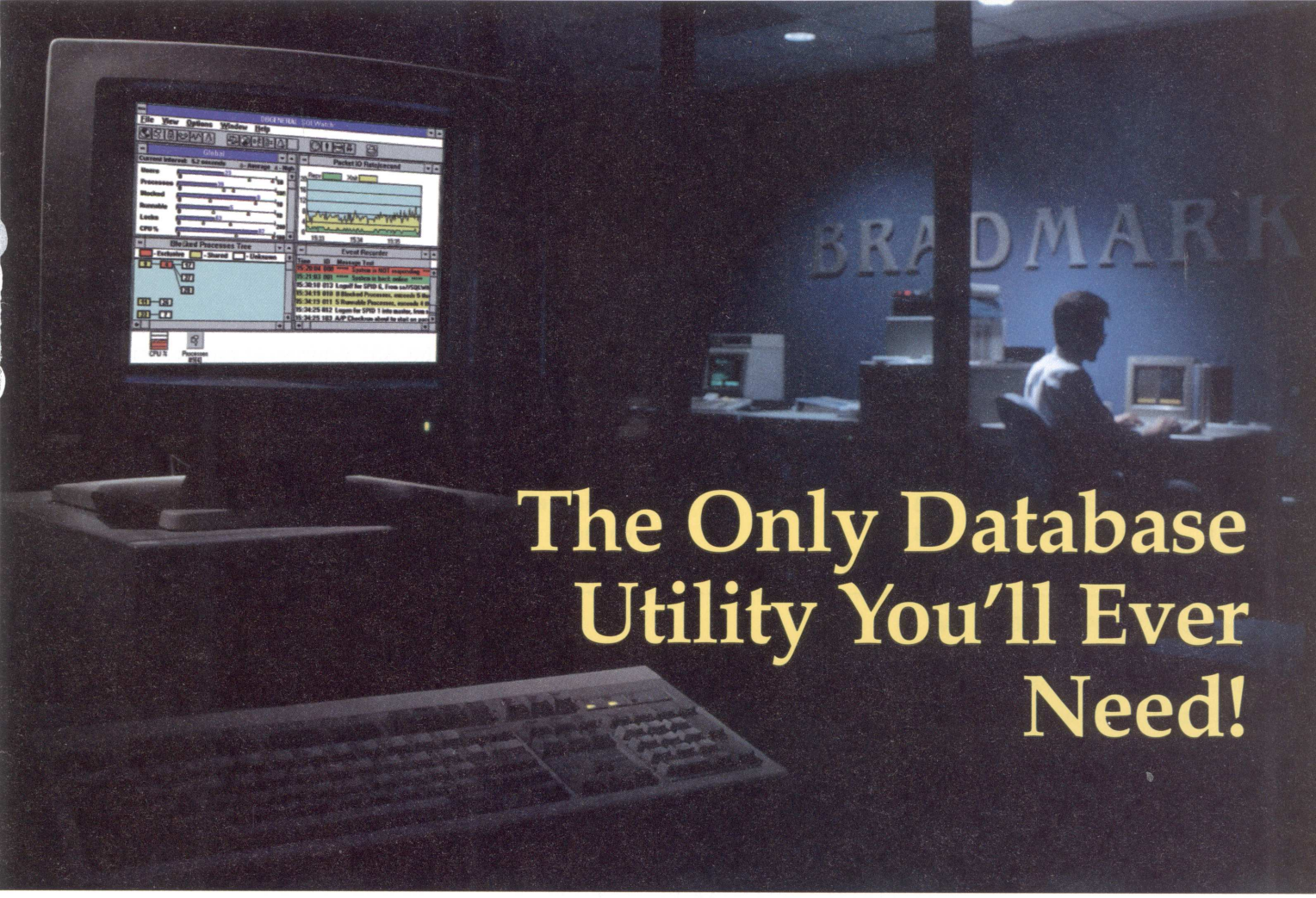
```
CI> TM OCT 5 1994 9:56:00 AM
```

We see that TEST is still scheduled at *exactly* 10 a.m.:

```
Program                 DataPartition CodePartition
Name   Prio   PC   Seg  Size Status   Size Status  Program
Status ----------------------------------------------------
Session  70  Superuser WALT
CI       51 17722c   1    26 in         51 sh      waiting for WH..A
         Shared EMA used: Environment 70
WH        5 12323          18 in                   scheduled
TEST      5     0          18                      dormant
          Will run in   4 minutes at 10:00:00:000 AM, every hour.
-------------------------------------------------------------------

Wed Oct  5, 1994   9:56 am
```

After 10 a.m. we see the following:



The Only Database Utility You'll Ever Need!

Introducing DBGENERAL's premier line of Database Management Tools...

DB GENERAL
THE DATABASE CONSOLE™

The Performance Activity Monitor
The first Windows-based product for **ORACLE** and **SYBASE** to bring mainframe database performance monitoring to the Client-Server environment.

Tablespace Management and Defragmentation Tool
The first graphical display tool for **ORACLE** that visually shows the logical and physical structures of a database and cleans-up free space fragmentation... a major cause of performance degradation.

And finally,
The premier IMAGE Database Utility
For over 10 years, **DBGENERAL** has become the most complete database management utility available for the HP3000.

- ★ *Monitor Multiple Servers Concurrently*
- ★ *Monitor Server Statistics in Real Time*
- ★ *Record User-Defined Events*
- ★ *Perform Structural Analysis*
- ★ *Perform Expert Global Diagnostics*
- ★ *Defragment Free Space Online*
- ★ *Perform Maintenance Scheduling*

With **DBGENERAL's Database Console**, you command every resource within your environment. So call to get your **FREE** 30-day evaluation kit, and put **DBGENERAL** to work for you today.

In the U.S. call: 1-800-ASK-BRAD (275-2723)
For our European offices:
Tel: (+44) 905-795444 or Fax: (+44) 905-795531

HEWLETT PACKARD Channel Partner
ORACLE BUSINESS ALLIANCE
SYBASE open solutions partner

BRADMARK Technologies, Inc.
Providers of premier data management solutions.

CIRCLE 41 ON READER SERVICE CARD

```
Program                  DataPartition CodePartition
Name    Prio    PC    Seg  Size Status    Size Status  Program
Status ------------------------------------------------------
Session  70  Superuser WALT
CI       51 17722c   1     26 in          51 sh      waiting for WH
   Shared EMA used: Environment 70
WH        5 12323          18 in                     scheduled
TEST      5     0          18                        dormant
         Will run in  54 minutes at 11:00:00:000 AM, every hour.
-------------------------------------------------------------
Wed Oct  5, 1994  10:06 am
```

Note that TEST is scheduled to run at *exactly* 11 a.m. Now we adjust the system time again, and examine TEST's scheduled runtime:

```
CI> TM oct 5 1994 10:30:00 am
Wed Oct  5, 1994 10:30:00 am

Program                  DataPartition CodePartition
Name    Prio    PC    Seg  Size Status    Size Status  Program
Status ------------------------------------------------------
Session  70  Superuser WALT
CI       51 17722c   1     26 in          51 sh      waiting for WH
     Shared EMA used: Environment 70
WH        5 12323          18 in                     scheduled
TEST      5     0          18                        dormant
Will run in  43 minutes at 11:13:13:370 AM, every hour.
-------------------------------------------------------------
Wed Oct  5, 1994  10:30 am
```

Now we see that TEST is no longer scheduled at exactly 11 a.m., but has been shifted to maintain the one-hour offset from the initial runtime. Note that WH does not show whether the program is absolutely or relatively scheduled.

This is the way it is documented to work in the *User's Manual* under "TM." If you have processes that you want time scheduled absolutely, then what you need is "cron," which will be available with the 6.2 release of RTE-A. cron on RTE-A will be very similar to cron on HP-UX, allowing absolute runtime scheduling.

Q: I have just installed a new 12076A LANIC in my A900 system. When I bring up NS1000, NSINIT reports the following error:

** (4101) NSINIT: Error storing Station Addr. Driver Reports:10.

and

** (4102) NSINIT: Error Registering MCAST Address. Driver Reports:10.

I don't see this problem with an older card. What has changed?

A: The firmware on the LANIC card was updated at 6.1. A side effect of this firmware update is that not only must the 12076A LANIC be connected to the MAU and LAN cable *before* NSINIT runs, but the MAU must also supply the SQE (Heartbeat signal). This is usually controlled through a configuration switch on the MAU. If the 12076A LANIC detects the absence of the SQE (Heartbeat signal), the error 10 is reported. An SR (5003215079) has been filed to correct this.

The following changes were made to the LAN firmware:

1. Modified the LAN firmware to improve the performance.
   a. Reduced the instructions in the Interrupt Service Routines.
   b. Bypassed some State Machine states.
   c. Returned the card response as soon as possible.
   (This fixes a potential 10B driver error.)
2. Supported the discard ARP mode on the card.

A new subfunction, 36B - ARP packet filter mode, is added for the LAN driver to enable or disable the ARP packet filter mode. If this mode is enabled, either the LAN driver (LAN firmware prior to 6100) or the card (LAN firmware revision 6100 and 6110) will discard ARP request packets with target IP addresses that do not match the local IP address.

Note that the firmware does not require 6.1 software, but only the 6.1 software will be able to use packet filter mode.

The revision 6100 12076A firmware was found to have a problem; thus the current revision is 6110.

The new ROMs are available in kit form as 12076-60003. The new part numbers are 12076-81009 and 12076-81010.

Notes:

1. There should be no compatibility issues with new firmware and older software drivers.
2. NSINF, L can be used to determine the revision of the LAN firmware. The following shows part number/revision history:

Part number	Revision (decimal)	Notes
12076-81004/5	2547	Original release
12076-81007/8	3136 (6100 OCTAL)	Should have been 6100 DECIMAL
12076-81009/10	6110	Current

Other products/mechanisms are slated for testing and will be added to the list of supported products as soon as all necessary testing has been successfully completed. ◧

Q: What are the latest supported SCSI disks and MO drives for RTE-A?

A: The following are the newest additions to the list of supported SCSI peripherals:

C2550B	HP Model 1300T 1.3-GB Optical Subsystem
C3040R/T	Series 6000 2-GB SCSI Mass Storage System
C3041R/T	Series 6000 4-GB SCSI Mass Storage System
C3044U	2-GB Single-Ended SCSI Disk Expansion Kit

These are currently supported on RTE-A revision 6.1. Testing for support on Revision 6.0 is being done and may be completed by the time you read this.

Note: customers on older revisions who are *not on support* and wish to move to Revision 6.1 will have to repurchase the O/S software (P/N 92077A).

Walt Boeninger works in the HP Response Center in Mountain View, California. He has been supporting the HP 1000 for 15 years.

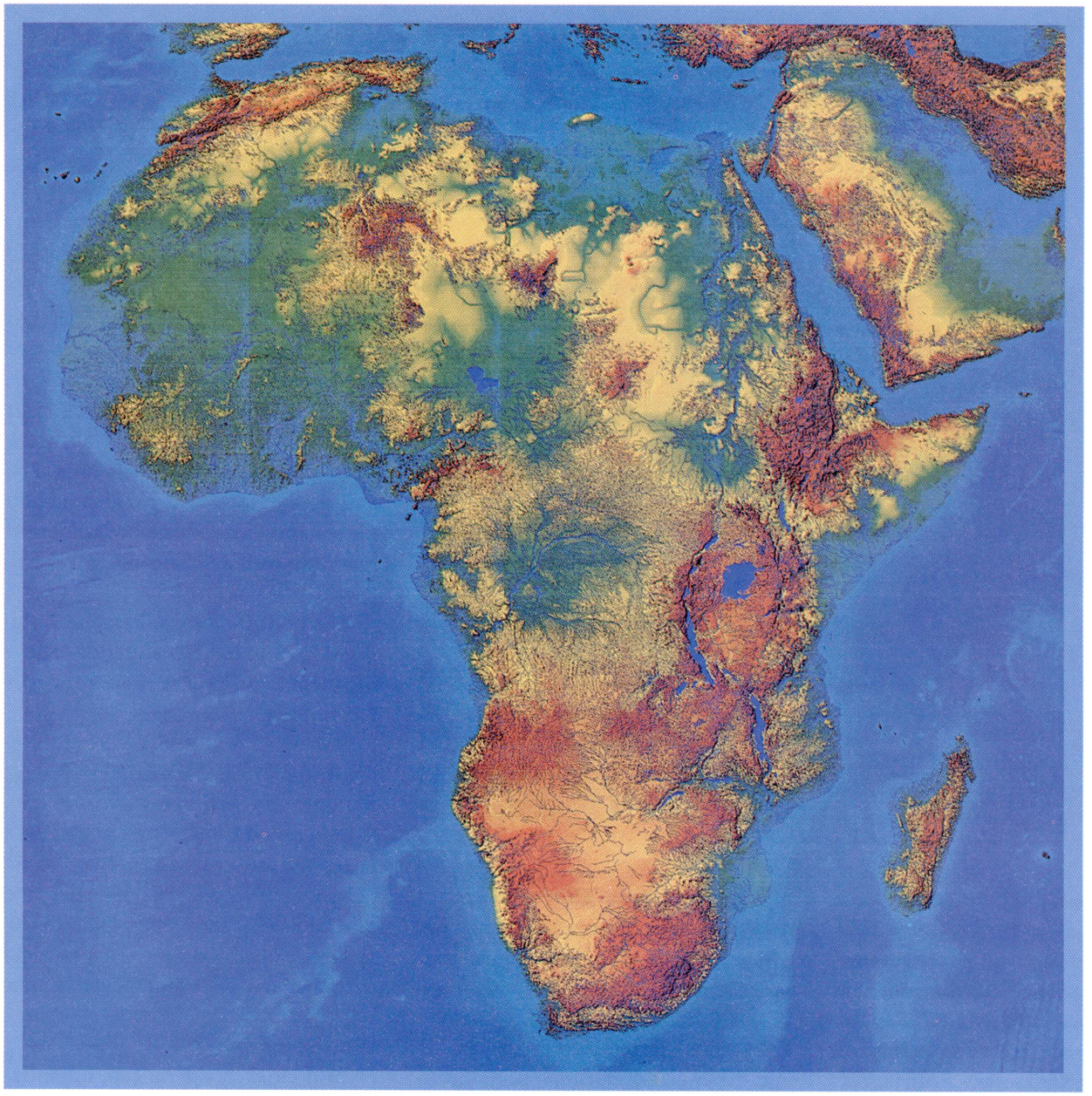
Since its inception about 25 years ago, geographic information systems (GIS) technology has come a very long way. The GIS industry continues to grow, and in doing so helps us deal effectively with many of the most difficult problems we face today.

More than ever before GISs are becoming recognized as useful and necessary tools, and are widely used in many organizations, public as well as private, around the world. Utility companies use them for facilities management. Politicians use them to adjust political boundaries. Delivery companies use them to route vehicles. Environmental scientists use them to manage wildlife. Police departments use them to study crime patterns.

As GIS technology becomes more widely used in many industries and organizations for an ever-increasing number of applications, it becomes apparent that the system needs to be more integrated. Disparate applications must all function under the umbrella of a single, integrated environment. The key to the future of the GIS industry is the ability of the data model to support new functionality and to adapt to virtually any application.

What Makes Up a GIS?

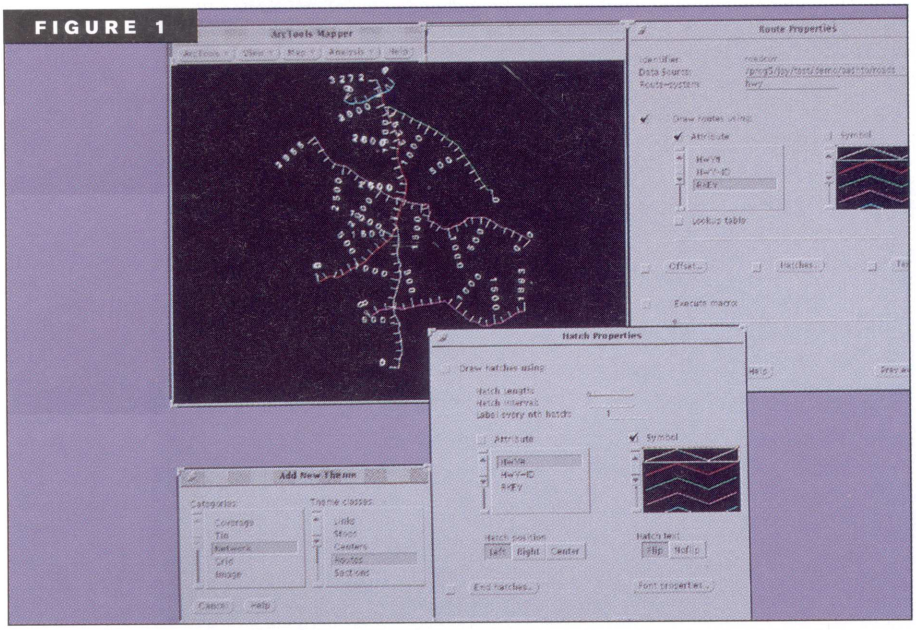
An effective GIS blends technology with data, people, and applications to make a fully functional geoprocessing system. A good GIS provider supports clients with more than just technology; it provides complete GIS solutions. A vendor's approach to the five parts of a GIS—applications, people, data, hardware, and software—describes that vendor's reliability and commitment to GIS as a tool used for the client's success.



Understanding Geographic Information Systems Software

by Michael W. Michelsen, Jr.

FIGURE 1



Applications. Organizational needs define the goals of the GIS, and these needs vary from site to site. To be effective, the GIS must provide core functionality, yet be adaptable and extensible to the unique requirements of each application. ESRI's ARC/INFO software offers ARC Macro Language (AML) and ArcTools for the development of simple or sophisticated applications designed specifically for an organization and using its own terminology and procedures. ARC/INFO software also supports a number of functions to help users get started quickly in applications as diverse as redistricting or crime analysis (see *Figure 1*).

People. Vendor resources should be available to help an organization's staff become GIS experts. A comprehensive training program, clear and concise documentation, and responsive technical support services ensure that your staff thoroughly understand their GIS, and can apply it knowledgeably to solve complex problems within their organization. A program unique to ESRI's ARC/INFO software users is the Rent-a-Tech program, which provides short-term consulting, programming, and custom training services to existing users. With this program, ESRI "rents" the services of highly skilled and experienced consultants and technical staff members to ARC/INFO software users who wish to take advantage of their specialized services on a short-term basis for a predetermined period of time and work program.

Hardware. A GIS product's hardware independence offers users several distinct advantages. Hardware independence lets users choose the computer platform that best meets the needs of their organization by allowing them to take advantage of existing hardware investment or giving them the freedom to choose a new system based on requirements such as performance, expandability support, and cost. This flexibility includes the operation of a GIS in a mixed hardware environment. Workstations and PCs can share the same data, and are not restricted to a homogeneous set of hardware to operate the GIS.

ARC/INFO software runs on all four major classes of computers (PCs, engineering workstations, minicomputers, and mainframes) using native operating systems, on more than 20 different hardware platforms, including Hewlett-Packard systems.

ESRI has established reseller relationships with hardware vendors, allowing them to propose complete turnkey GIS systems.

Software. A GIS serves as an integrative force in an organization, allowing multiple and scattered sources of data to be accessed from a single workstation using one software system. A reputable GIS software vendor will offer a full suite of services (i.e., consulting, ability to customize, embedded functions) to meet the specific needs of individual clients.

Why Geography?

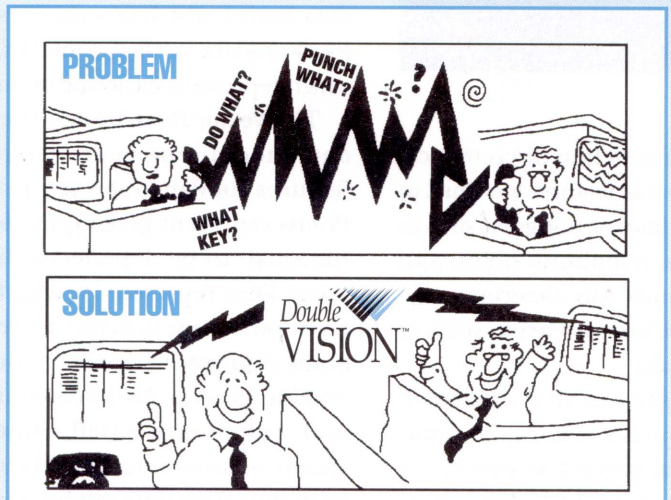
In their daily operations, organizations use information related to many different topics, such as customers, inventories, finances, and facilities. Geographic information (information about location) affects all of these topics and so affects many decisions about them. For example, fire trucks are sent to fires by the fastest route available; retail stores are located based on traffic flow, highway access, and number of complementary businesses; social programs are delivered in areas where a need is identified; and goods are distributed to a client from the nearest warehouse.

Given the number of applications for geographic information, each person in an organization may have a different purpose and use for the data stored in a

Continued

Double VISION™

Access And Control Any Terminal, Anywhere, Without Leaving Your Seat.



Double your efficiency. Double your productivity. Double your savings.

Sound impossible? Not with Double VISION™!

Double VISION™ is THE premier remote control software utility for UNIX systems. It literally allows you to be in two places at once! No, its not a teleportation device, but easy to use, highly functional, remote control software. It allows a support engineer to see what is on another user's screen AND have full control of the keyboard. From his terminal, your engineer can see user problems for himself and solve them FAST. To the troubled user, it will seem as if your engineer is watching over their shoulder. Double VISION™ doubles your efficiency!

Double VISION™ will allow your support engineers to cut their average support call time in half, and completely eliminate most on-site visits. Never again will your support engineers go on-site to "see the problem for themselves". Think about it; less time spent on the phone, and less time spent on the road, equals more customers helped and more problems solved. Double VISION™ doubles your productivity!

Double VISION™, however, goes far beyond being a great support tool. Thousands of users worldwide are using it to conduct training classes and remote demonstrations without sending personnel on-site. Imagine the increase in sales when you can show your prospect that hot new product while he sits in his office, and you sit in yours. No more traveling, no more overnight shipping of demo software, no more waiting to close sales. Finally, you can conduct highly interactive, highly effective, training sessions and product demonstrations all while saving hundreds, even thousands of dollars in travel expenses. Double VISION™ doubles your savings!

Now that you know what Double VISION™ can do, what are you waiting for? Get your first copy today, and see for yourself why we say—

Double VISION™...Because a picture is worth a thousand words!

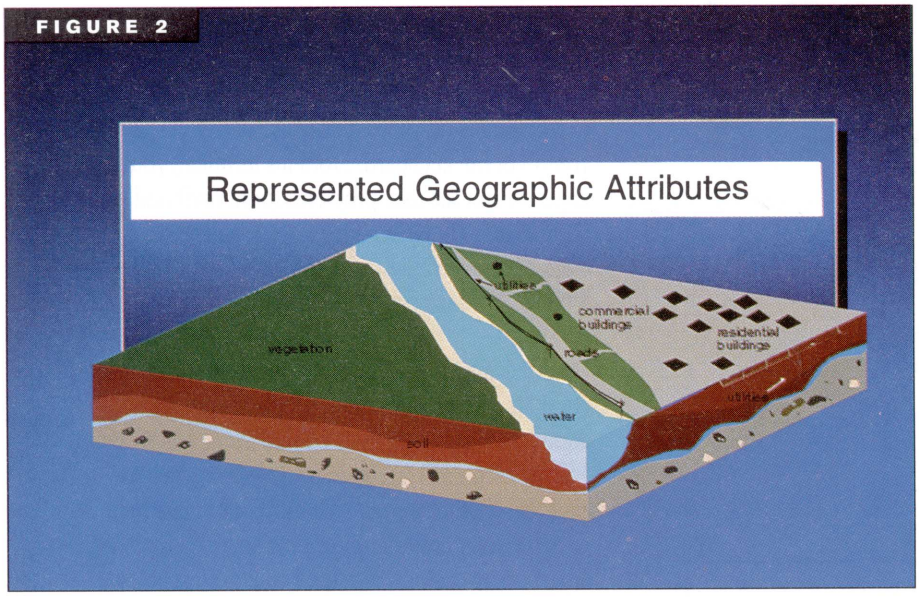
MaxTech

MaxTech **Now Available for X Windows**

1000 Cobb Place Blvd., N.W. • Building 200 • Suite 240 • Kennesaw, GA 30144

800-582-9337 • 404-428-5000 Office • 404-428-5009 Fax

FIGURE 2



GIS. To best evaluate implementation options, it is important to understand these organizational views. Departmental documents and the information systems group are good places to gain organizational viewpoints. To help you design the most appropriate geographic information representation and maximize storage and analysis, this article will describe GIS concepts and models for storing geographic information.

How Maps Present Geographic Attributes

Geographic attributes are features on or near the surface of the earth. Geographic attributes can be natural features, such as rivers and vegetation, manmade features, such as roads, pipelines, and buildings, or legal or political boundaries, such as parcel boundaries or county limits.

Maps display models of the real world using points, lines, and polygons. Symbols and labels describe these objects for the reader (see *Figure 2*).

Points. Points define discrete locations of geographic features too small to be depicted as lines or polygons, such as well locations, telephone poles, and buildings. Points can also represent locations that have no area, such as mountains peaks.

Lines. Lines represent the shapes of geographic objects too narrow to depict as areas, such as streets and streams, or linear features that have length but no area, such as elevation contours.

Polygons. Polygons are closed areas that represent the shape and location of homogeneous features, such as states, counties, parcels, soil types, or land use zones.

How Maps Convey Spatial Relationships

Relationships are important to us; they help us to understand situations and to make decisions. A relationship among geographic features based on location is called a spatial relationship. Spatial relationships are implicit on maps; to have value they depend on the reader to interpret them. Since this information is not explicit, you, the reader, interpret these relationships and derive information from the position of mapped objects, such as streets, contours, buildings, lakes, railways, and other features.

Using Computers to Represent Geography

A GIS presents geographic features as a spatial data model. There are three such models: the vector data model, which closely resembles a map model; the raster data model, which describes a specific location on the earth; and the TIN model, which represents the shape of surfaces.

The Vector Data Model. The vector data model represents geographic features similar to the way maps do. Points represent geographic features too small to be depicted as lines or areas; lines represent geographic features too narrow to depict as areas; and areas represent homogeneous geographic features. An *x,y* coordinate system, commonly called a Cartesian system, references real-world locations. With the vector data model, each location is recorded as a single *x,y* coordinate. Points are recorded as a single coordinate. Lines are recorded as a series of ordered *x,y* coordinates. Areas are recorded as a series of *x,y* coordinates defining line segments that enclose a polygon.

With *x,y* coordinates, you can represent points, lines, and polygons as a list of coordinates instead of as a picture or graph.

The vector data model represents each surface as a series of isolines; for example, elevation is represented as a series of contours. However useful for displaying information, this model does

not easily support the calculation of surface characteristics such as the slope of the surface at a particular point, or the direction that the slope is facing. Both of these characteristics are important for analysis involving surfaces.

The Arc-Node Data Structure. To draw the boundaries of two adjacent land parcels on a map sheet, you probably would not retrace the common boundary; doing so is inefficient. The same applies to storing a common boundary in the computer, where possible duplication is avoided.

Repeating the coordinates for a point shared by a number of lines is inefficient, because the point would be stored many times. Storing each polygon as a closed loop of coordinates is also inefficient, because the sides between adjacent polygons would be stored twice. A more efficient way to store vector data is the arc-node data structure.

The arc-node data structure stores and references data so that nodes construct arcs and arcs construct polygons. Nodes define the two endpoints of an arc; they may or may not connect two or more arcs. An arc is the line segment between two nodes. An arc is composed of its two nodes and an ordered series of points called vertices, which define its shape. Nodes and vertices are represented as *x,y* coordinates.

Topology

Standing on a street corner looking at a map is a fairly easy way to identify intersecting streets and properties that are adjacent. The computer "sees" these relationships by means of topology.

Topology explicitly defines spatial relationships. The principle, in practice, is quite simple; spatial relationships are expressed as lists (e.g., a polygon is defined by the list of arcs comprising its border).

Continued

Creating and storing topological relationships has a number of advantages. Data is stored efficiently, so large data sets can be processed quickly. Topology facilitates analytical functions, such as modeling flow through the connecting lines in a network, by combining adjacent polygons with similar characteristics, to identify adjacent features and overlay geographic features.

The Raster Data Model

The discussions of maps and the vector data model focused on how to represent geographic features. In the raster data model the focus is on location. The raster data model is more like a photograph than a map.

If you look at a photograph through a strong magnifying glass, you'll see that it is made up of a series of dots of different colors or shades of gray. The raster data model works in a similar way; it is a regular grid of dots (called cells or pixels) filled with values. In fact, when a picture is stored in a computer, the raster data model is used.

In a raster data model there are no boundaries drawn on the photograph to distinguish features; there is a continuous surface. In the raster data model, the earth is treated as one continuous surface.

There are three ways to interpret each dot in the photograph. The first is to classify each as belonging to something; a group of similarly classified pixels becomes an object, like a street. The second way of interpreting is simply to measure the value of the dot's color or shade of gray; a pixel on one part of the photograph would be black, while a pixel in another part of the same photograph would be medium gray. The third way is to define the pixel relative to a known reference point, such as mean sea level (for elevation) or the point of an oil spill.

The same three interpretations can be used for the raster data model in GIS. The cell value can represent a classification, such as vegetation type. It can be a measurement, such as a satellite measuring the amount of light reflected by the earth. Finally, it can be an interpretation of elevation.

In the raster data model, each location is represented as a cell. The matrix of cells, organized into rows and columns, is called a grid. Each row contains a group of cells with values representing a geographic phenomenon. Cell values are numbers that represent nominal data such as land use classes, measures of light intensity, and relative measures.

Like the vector data model, the raster data model can represent discrete point, line, and area features. A point feature is represented as a value in a single cell, a linear feature as a series of connected cells portraying length, an area feature as a group of connected cells portraying shape.

The accuracy of a map depends on the scale of the map. In the raster model, the resolution and, hence, accuracy depend on the real-world area represented by each grid cell. The larger the area represented, the lower the resolution of the data. The smaller the area covered, the greater the resolution and the more accurately features are represented.

Linking Attributes to Features–The Georelational Model

On maps, symbols and text convey descriptive information. Often, the textual information provides a way of accessing additional information organized in other tool for referencing information.

The same concept applies to the spatial data models. One powerful capability of GIS lies in the link between the spatial data and the tabular (descriptive) data. A hybrid data model, often referred to as the georelational model, is used to maintain the connection between features and their descriptive data.

We have seen how features are represented through coordinates and topology and how descriptive data is organized as a series of records in tables. The next concept to understand is how a link is created between the spatial definition of features and their corresponding attribute records. The answer is quite simple: the unique identifier of a feature associates the attributes with the feature coordinates, maintaining a one-to-one correspondence between the spatial records and the attribute records. Once this connection is established, you can display attribute information or create a map based on the attributes stored in the attribute table.

A relational model concept can be applied to more than just keeping track of features and their attributes. Any two tables that share a common attribute can be related. A relate uses a common item to establish connections between corresponding records in two tables.

In a relate, each record in one table is connected to a record in another table that shares the same value for a common item. The common item is referred to as a key.

Organizing Geographic Information

We create classification schemes to understand and describe a complex world. Our classifications can be complex, as in the classification of vegetation, or simple, as in a child's classification of

toys as being fun or boring. Classifications are made based on common characteristics we use to describe the objects. Classifying geographic features helps you model how you view your world and decide which distinctions are important. A good classification scheme will help you translate your view of the real world into the appropriate spatial data models in your GIS.

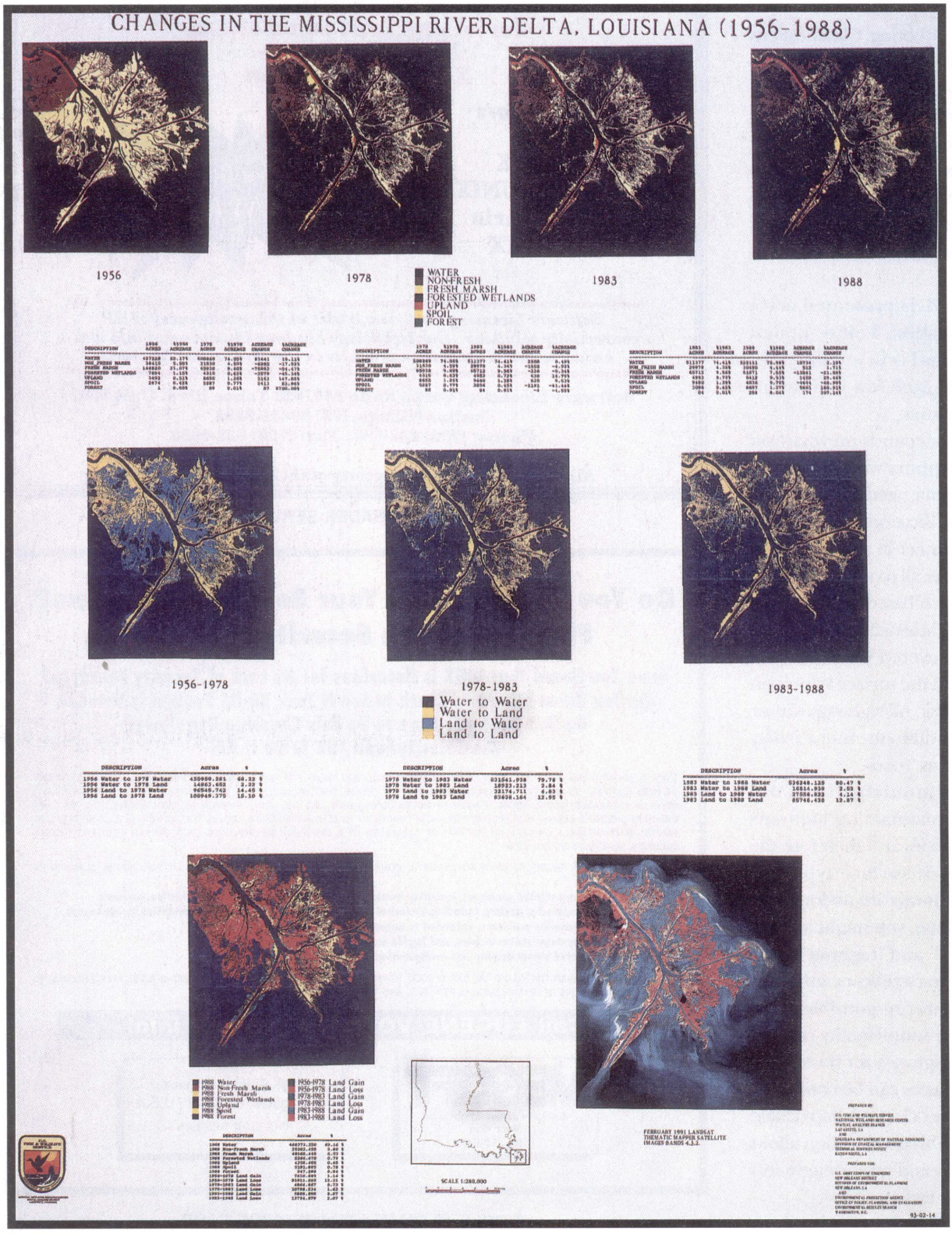
The data models presented are a form of classification. Points, nodes, arcs, polygons, and cells are different classes, because each has a different set of characteristics.

Classification depends on what you are trying to support with your GIS. Understanding your needs will help you decide about classification. For example, as a roadway engineer in a municipality, you might consider all roads in one class. The classification is based on a number of common characteristics: roads have lanes; they are covered with a surface (e.g., asphalt) and the surface is in a particular state of repair. All highways, streets, and lanes falling within the municipality would be classed as 'road'.

Perhaps the municipality is not responsible for maintaining highways within its boundaries and therefore the characteristics of surface type and condition for highways are no longer of interest. In this case, you might identify two classes, 'road' and 'highway', each with different characteristics or attributes.

A transit engineer responsible for all bus routes in the municipality can use both roads and highways for route planning. The two classes can be combined into a higher-order class, perhaps called 'thoroughfare'. This classification allows both the roadway and transit engineers to perform their tasks.

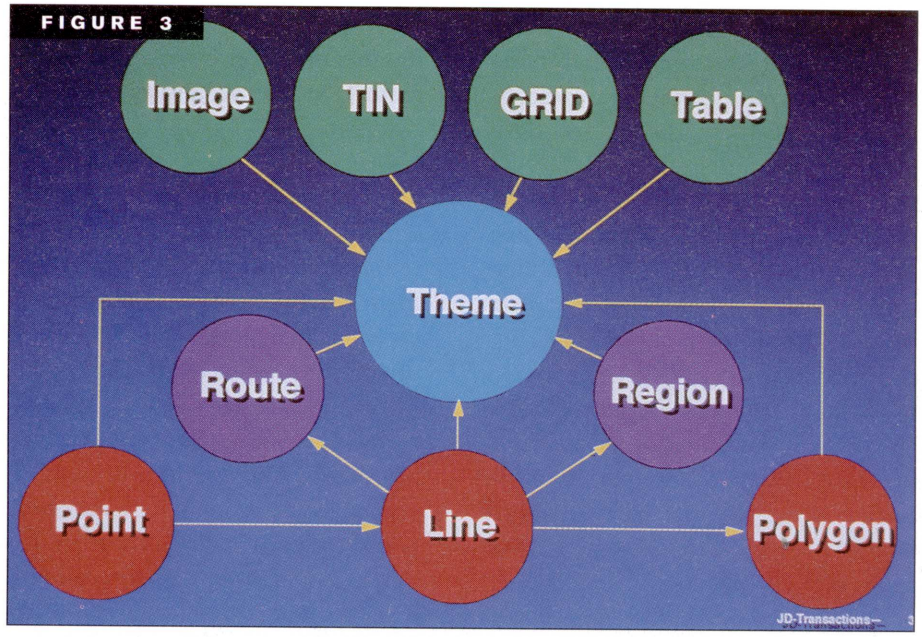
The last example is a case in which


CHANGES IN THE MISSISSIPPI RIVER DELTA, LOUISIANA (1956-1988)
1956
1978
1983
1988
WATER
NON-FRESH
FRESH MARSH
FORESTED WETLANDS
UPLAND
SPOIL
FOREST
1956-1978
1978-1983
1983-1988
Water to Water
Water to Land
Land to Water
Land to Land
1956 Water
1956 Non-Fresh Marsh
1956 Fresh Marsh
1956 Forested Wetlands
1956 Upland
1956 Spoil
1956 Forest
1956-1978 Land Gain
1956-1978 Land Loss
1978-1983 Land Gain
1978-1983 Land Loss
1983-1988 Land Gain
1983-1988 Land Loss
SCALE 1:250,000
FEBRUARY 1991 LANDSAT
THEMATIC MAPPER SATELLITE
IMAGES BANDS 4,3,2.

a higher-order class is composed of reasonably similar classes; vehicles can travel along roads and highways. It is also possible to create higher-order classes in which the underlying classes are different in nature. An airport, for instance, is a collection of runways and taxiways for planes, buildings for people, and parking lots for vehicles. The common characteristics of airports are that they have a name, a three-letter code, regular hours of operation, and so on.

Two of the most common considerations for organizing geographic information include the thematic grouping of features and their attributes, as described above, and the data representation to be used (vector, raster, and TIN), as described in the previous sections. If you choose the vector model, then additional options are available: point, line, polygon, route, and region (see *Figure 3*).

In organizing your data, you can classify geographic features with similar characteristics (roads, highways), group classes that are similar (roads + highways = thoroughfares), and group dissimilar classes (runways + taxiways + buildings + parking lots = airport).



Geographic Data Sets

The strength of any GIS lies in the methods available to represent geographic information. Geographic data sets are the data models supported by the GIS to represent geographic information. They include the coverage for vector data, grids for raster data, triangulated irregular networks (TINs), and lattices for surface representation, images, and CAD drawings. A GIS allows you to combine these geographic data sets into a single geographic database.

Each geographic data set is characterized by the features it depicts, its method for representing shape and location, and its utility for various geographic operations. Each model has its own advantages and limitations, and supports operations that other data types may not. This section presents the key components and data structures of each geographic data set.

Coverage. The coverage is a GIS's primary method for storing point, line, and area geographic features. Your database will typically contain several coverages, each representing a single set of geographic features such as roads, parcels, soil units, and forest stands in a given area. The coverage supports the georelational model—it contains both the spatial (location) and attribute (descriptive) data for geographic features.

Coverage feature classes. Feature classes are used on the coverage for storing real-world geographic features represented as points, lines, or areas. They include point for storing features; arc, node, and route-system for storing linear features; and polygon and region for storing areal features. Each of these feature classes stores attribute information in a corresponding feature attribute table. Additional feature classes support the displaying of annotation, data capture, and query. These include annotation, tic, and boundary.

Three topological concepts are used to define features: arc-node, left-right, and area definition. ARC/INFO software stores coordinates only for points, arcs, and nodes, and uses topological relationships for defining networks and polygons. Networks and polygons form the framework for defining route-systems and regions.

Arc-node topology defines the connectivity of arcs; arcs connect at nodes. A set of connected arcs can define a network—for example, the street network formed of street segments (arcs) connected at intersections (nodes). Polygons are defined using left-right and area definition topologies. A polygon is

defined as an ordered set of connected arcs, with the constraint that the first and last arcs must connect (area-definition). For each arc, the left and right polygons are identified (left-right).

Route-systems are also defined as an ordered series of arcs; however, the first and last arcs need not connect. Route systems are useful for representing pathways along a network—for example, bus routes and airline routes. You can also use them to section a network, for example, defining sections of a pipeline based on the diameter of the pipe. In addition, you can identify specific points along a network, such as the location of a sign along a highway.

Regions are defined as a set of polygons. They are useful for representing geographic features comprising several polygons—for example, the state of Hawaii as a set of islands. You can also use them in a single coverage for representing different features occurring in the same area and possibly overlapping—for example, habitats for moose or deer. In addition, you can identify hierarchical features—for example, a census tract comprising census blocks.

The following summarizes the feature classes used to store geographic features in a coverage. Together, these feature classes provide considerable flexibility in modeling the real-world.

Coverage uses. Coverages represent the primary geographic data set for GIS applications and have particular utility for:

- Location and shape representation. Geographic features are represented using *x,y* coordinates. Their location and boundaries are captured in a variety of ways, including digitizing, scanning, and coordinate geometry techniques. The accuracy of the representation is dependent on a number of factors such as input scale, method of capture, and extent of the coverage.
- Linear network representation. Arc-node topology is well suited for representing and modeling linear features from streets and road systems to electrical systems, sewers, pipelines, and other linear networks. A linear network of arcs and nodes forms the spatial infrastructure for defining routes, address geocoding, and path-tracing algorithms. Route-systems form a reference for describing the location of point and linear features. For example, a sign on a highway is referenced to a milepost. Road conditions are similarly referenced to two mileposts, defining beginning and ending points.
- Areal feature representation. Polygons within coverages define geographic features with well-defined boundaries, such as parcels and administrative units (counties, census tracts, states, and countries). Regions allow you to represent geographic features as a single polygon or as multiple polygons. Regions also allow a polygon to represent a number of different features in a coverage. Therefore, you can represent two or more overlapping geographic features and features that are nested.
- Cartography. Maps require base map features on top of which other information is presented. Base map information is stored as a set of coverages allowing cartographic maps to be produced from coverages and additional geographic data sets such as grids or images.
- Analysis. Data analysis functions applied to the coverage feature classes support a wide variety of applications. A few of these include parcel assessment, pavement management, bus routing, emergency response planning, pipeline planning, sales analysis, and wildlife management.

Managing multiple coverages. A GIS database consists of many coverages containing many geographic features. Users will want to access data both by area and by geographic feature. This requires that you understand, precisely, the extent of your coverages and the geographic features they contain, including related information in external databases. The ARC/INFO ArcStorm data storage facility, which manages such information, can help you manage the integrity of your data through features such as unified transactions on your coverage features and their related attributes in external tables, and locking of geographic features so that only one update can be made at a time.

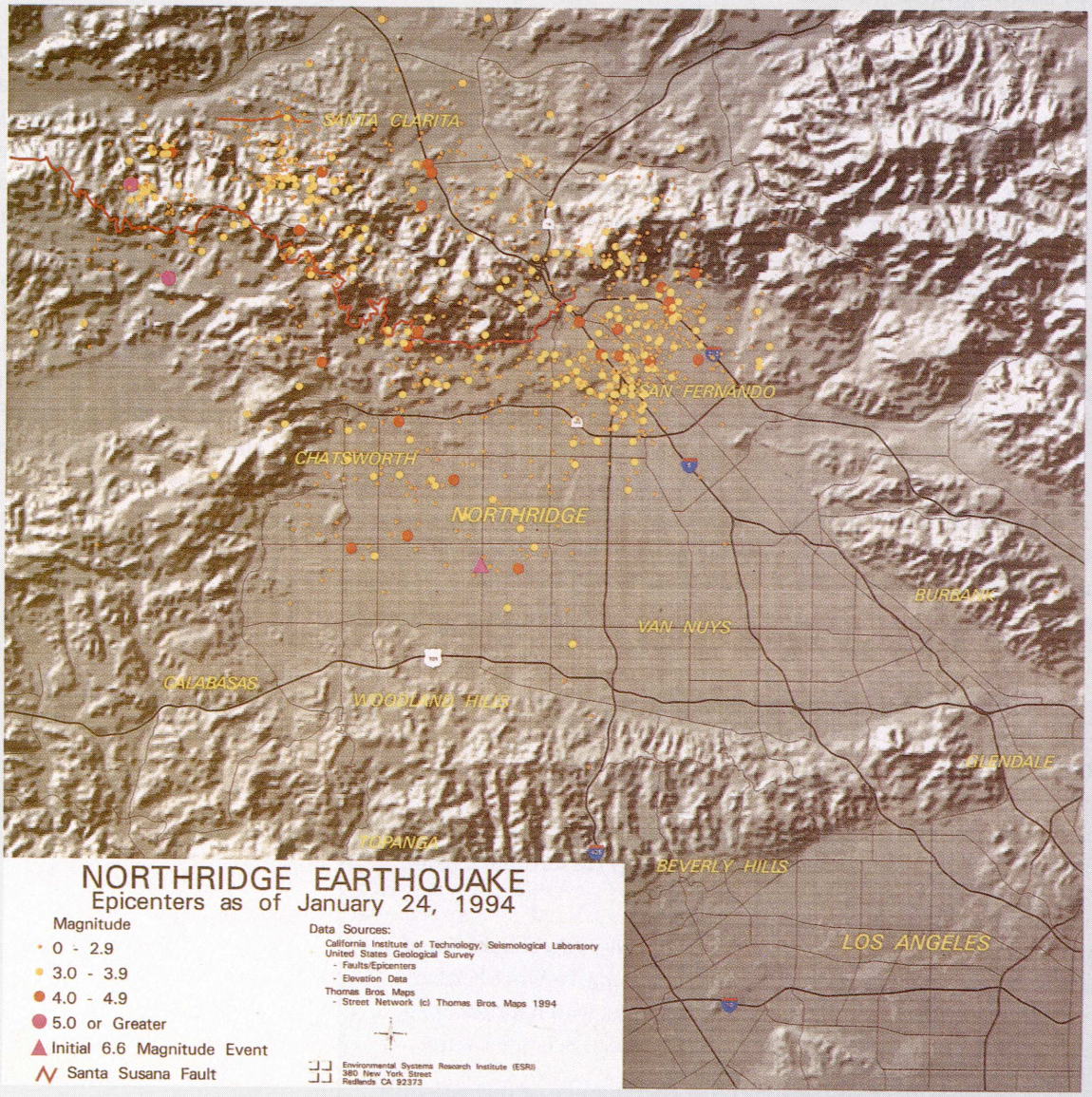
Grid

The grid geographic data set is the cell-based equivalent of a coverage in GIS software. It is the primary data structure used by ARC/INFO GRID software; thus it can be easy to confuse the term GRID with grid. GRID is the product name; grid is the cell-based data on which the GRID software operates.

Each grid represents a spatial variable. While coverage features are stored as a series of *x,y* coordinates and topological relationships, grid cells are stored as rows and columns.

The cell is the primary spatial entity within a grid. Each cell is square, has the same size as other cells in the grid, and contains a numeric value representing the spatial variable at that location. Cell values can be 32-bit integer or real (floating-point) numbers.

Continued


SANTA CLARITA
SAN FERNANDO
CHATSWORTH
NORTHRIDGE
BURBANK
VAN NUYS
CALABASAS
WOODLAND HILLS
GLENDALE
TOPANGA
BEVERLY HILLS
LOS ANGELES
NORTHRIDGE EARTHQUAKE
Epicenters as of January 24, 1994
Magnitude
0 - 2.9
3.0 - 3.9
4.0 - 4.9
5.0 or Greater
Initial 6.6 Magnitude Event
Santa Susana Fault
Data Sources:
California Institute of Technology, Seismological Laboratory
United States Geological Survey
- Faults/Epicenters
- Elevation Data
Thomas Bros. Maps
- Street Network (c) Thomas Bros. Maps 1994
Environmental Systems Research Institute (ESRI)
380 New York Street
Redlands CA 92373

The coordinate system of a grid is the same as that for other geographic data. The rows and columns are parallel to the *x*- and *y*-axes of the coordinate system. Since each cell within a grid has the same dimension as other cells, the location and area covered by any cell is easily determined by its row and column. The coordinate system of a grid is thus defined by the cell size, the number of rows and columns, and the *x,y* coordinate of the upper-left corner. Grids also carry additional information, such as the coordinate system associated with the grid.

Trends in GIS Software Technology

Reputable GIS software vendors frequently will release versions of their products as appropriate new technology and functionality are developed. As with most products, trends in the industry in general, and the GIS industry in particular, also influence vendor decisions to release revisions of GIS software products.

Technological Advances. Factors such as the dropping prices of computer hardware, new developments in workstation and network architecture, advances in graphical user interface (GUI), the move toward an instrumental universe, and the adoption of new industry standards give GIS more power and versatility to solve problems. Recent advances in desktop computer technology have brought sophisticated software within the reach of many more people. GIS vendors are developing new geoprocessing tools designed to take full advantage of the latest technology and to bring sophisticated GIS capabilities to your desktop.

Maturation of Technology. With the maturation of GIS technology and the realization of many new sophisticated uses for it, GISs are continuing to solve very simple problems, but increasingly are also being expected to solve more complex problems.

Where Next?

As the mass market for GIS products is created, many of society's problems addressed with the technology will be solved with more useful data. To an extent never before imagined, we are realizing the tremendous sources of data available, along with the technology available to make these data more accessible to us.

For people to use a GIS on a particular application, the needed data must exist and the user must know they exist, must have access to them, and must be able to make effective use of them.

The technology is here; we must now be prepared to use it. ◧

MAP CREDITS

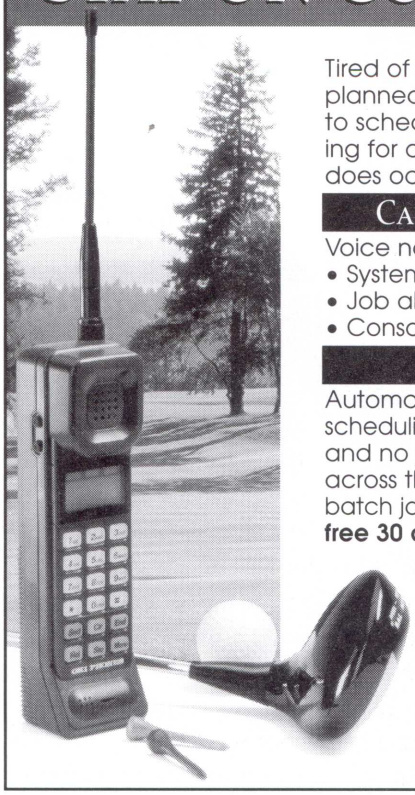
Elevation Data of Africa (cover and page 25): U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota; by Kevin Larson, Sue Jenson, Gayla Evans, and Dean Gesch.

Changes in the Mississippi River Delta, 1956–1988 (page 32): U.S. Fish and Wildlife Service, NWRC, JCWS, Lafayette, Louisiana; by Vince Sclafani, contractor for Johnson Controls World Services, who handles operations at the National Biological Survey Southern Science Center.

Northridge Earthquake Epicenters (page 35): California Institute of Technology and Environmental Systems Research Institute; by Ann Lilje and Kerry Sieh (Cal Tech), and Pete Bottenberg and Eric Bader (ESRI). Portions of this image are copyrighted by Thomas Bros. Maps and are reproduced with permission granted by Thomas Bros. Maps.

Michael W. Michelsen, Jr. is a staff writer for ESRI, Inc., a major GIS vendor based in Redlands, California.

STAY ON COURSE! WHILE WE DO THE MONITORING



Tired of checking in on weekends or nights to verify that your data center is running as planned, when you could be spending this time enjoying one of your hobbies. With JMS to schedule and control your batch jobs, and with Callback to monitor your system looking for critical conditions, you can better enjoy your free time knowing that if a problem does occur, you will be notified by phone or pager.

CALLBACK SYSTEM DOWN DETECTOR AND JOB NOTIFICATION SYSTEM

Voice notification for:

- System hangs
- Job aborts
- Console messages
- Printer status
- Logon security
- Special job events
- Physical conditions
- Adverse temperature
- Power loss
- User requests
- Reply pending
- Spoolfile scanning

JMS JOB MANAGEMENT SYSTEM

Automated control for the scheduling and execution of batch jobs with very flexible scheduling capabilities and dependencies. Easy to use, no command language to learn and no jcl changes. JMS is a multiple-CPU system that allows jobs to have dependencies across the network. Ad hoc streamed jobs may be incorporated to allow complete batch job control. **Leaders in tools for the "Lights Out Environment". Call us today for a free 30 day demo. MPE/XL or HP-UX.**

Corporate Headquarters
1214 Hawthorne Ave. NE
P.O. Box 13086
Salem, OR 97309
Phone: (503) 585-0512
FAX: (503) 585-1706

International Sales Office
System Software Intl.
Oakmoore Court
Hampton Lovett
Droitwich, Worcs.
England WR9 0QH
Phone: 44 905 79 4646
FAX: 44 905 79 4505

DESIGN 3000 Plus INCORPORATED

CIRCLE 34 ON READER SERVICE CARD

Create CD-ROM Discs on Your Desktop

The first complete turn-key CD-Recordable (CD-R) solution for Unix allows you to create inexpensive CD-ROM discs for data archive or distribution.

Includes premastering software, an intelligent controller and a CD recordable unit. Supports all major Unix platforms including HP 9000, Sun, IBM RS/6000, Silicon Graphics, Digital and others.

HEWLETT PACKARD
Channel Partner

For more information, call Concorde Technologies, Inc. at **(800) 359-0282.**

CONCORDE TECHNOLOGIES

CIRCLE 53 ON READER SERVICE CARD

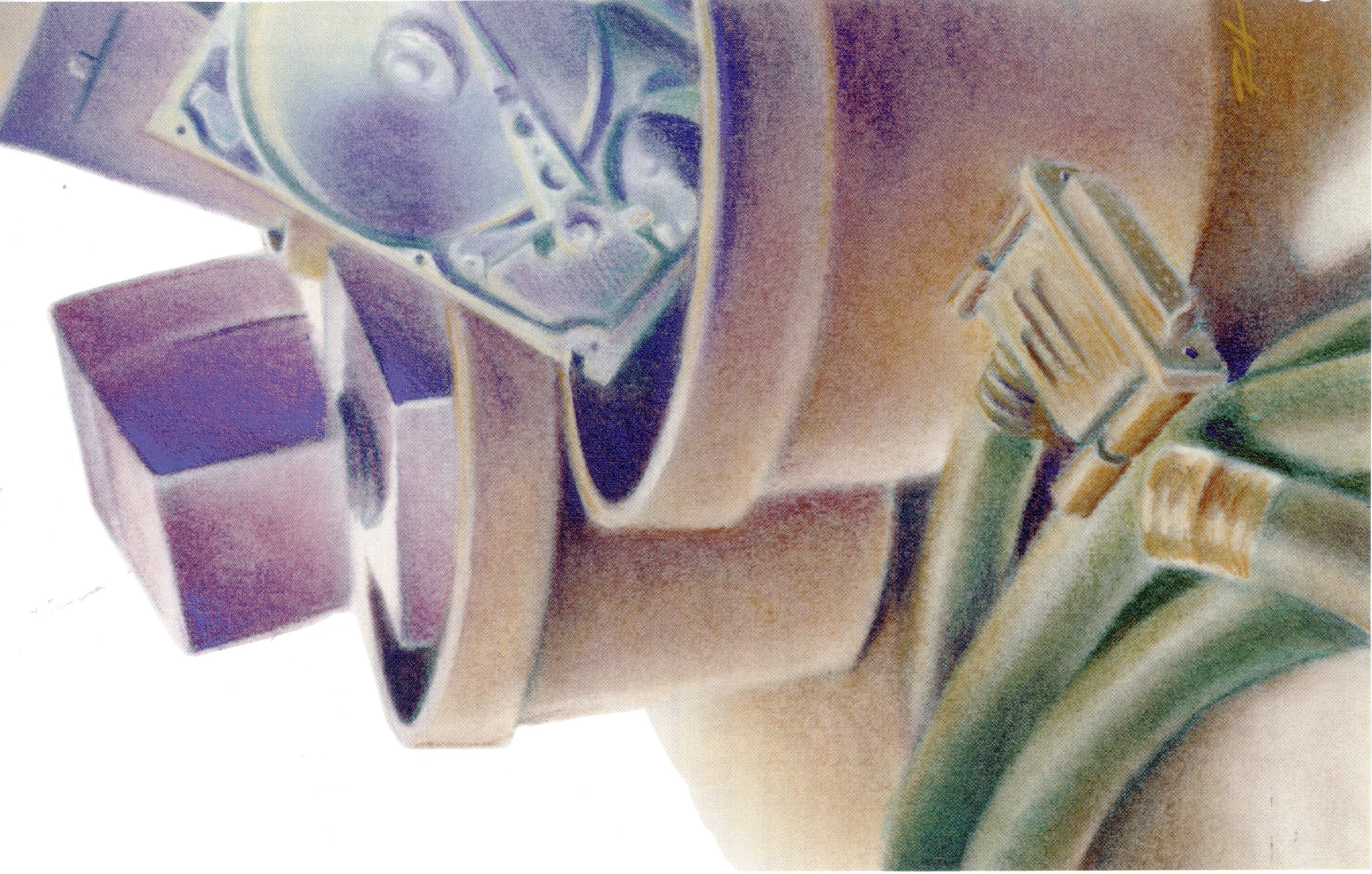


Illustration by Rebecca Hall

Using Non-HP disks with HP machines

by Sean Reifschneider

It used to be that if you wanted a disk for your HP workstation, your choices were either to go to HP and buy a high-quality and equally high priced drive or search out and take your chances with one of the handful of companies who were manufacturing compatible drives. Choice was limited because HPs used the HP-IB (IEEE-488) interface to talk to their peripherals.

In recent years the SCSI standard for device interfacing has made a much larger choice available to consumers. The good news is that this makes it possible to use hard drives from many manufacturers and even more distributors. The bad news is that these drives are not as easily connected to HP systems as the HP-supported drives. No need to panic though. Let's take a walk through the garden....

Hacking Disktabs for Fun and Profit

On HP-UX machines, there is a file in */etc* called *disktab* that contains information about all the drives that HP "officially" supports. This means that when you connect a supported drive to a machine and need to build a filesystem to prepare it for use, you just tell the *newfs* program that it's an hp7958. *Newfs* then looks in */etc/disktab* and sees that a 7958 is a 130-MB drive.

The chances of an aftermarket drive being listed in the *disktab* are pretty slim, but you should try searching for something that looks like your drive before you try to roll your own entry (for instance, some Quantum, Micropolis, and other disks are listed, several in an unsupported section).

If you can't find your drive listed, take a peek in the documentation that came with the drive. You probably won't find a suitable *disktab* entry, but you will likely find the manufacturer's tech support phone number. Some manufacturers have configurations for many of their drives available if you just ask them. For instance, within an hour of receiving my Micropolis 1.7-GB drive, I was receiving a fax from the company with *disktab* entries for many of their drives and instal-

lation tips. Fifteen minutes later the drive was connected and formatting.

An Example

To demonstrate how to create a *disktab* entry, I'll present a *disktab* for the Micropolis 2217 1.7-GB drive, discuss the fields, and describe how to come up with reasonable numbers for your own drive. Each entry is composed of fields separated by colons; lines are continued by placing a backslash at the end of the line.

```
MICROP_2217:\
    :no swap or boot:ns#54:nt#15:nc#2127:\
    :rm#5400:s0#1722870:b0#8192:f0#1024:
```

The first field is the device name to be used with the *newfs* command. If you examine the existing *disktab* file, you will see that there are several different entries for the same type drive specifying different amounts of storage reserved for booting and swap space. The second field is a comment. While it's not used by *newfs*, it can make your life much easier if you have to look at the entry months (or longer) after you initially wrote it. Current practice is to list the amount of space reserved for swap and booting.

Other fields have a keyword and an argument separated by the pound sign (#). Let's go through them in the order they appear above:

ns—number of 1-K sectors per track
nt—number of tracks per cylinder
nc—number of cylinders per disk
rm—revolutions per second
s0—size of file system in 1-K blocks
b0—block size for file system (must be 4096 or 8192)
f0—size of fragments in bytes (must be 1024, 2048, or 4096)

The first three fields are used to specify the size of the drive. If you multiply them together, they must not exceed the size of the drive as reported by *diskinfo*. The purpose of many of the parameters is to optimize the file system for the drive. As long as you obey the above rule, the most you risk is some performance.

In the example, *diskinfo* reports the size as 1725451 (1-K blocks). The numbers in the example leave us with 4 MB of the disk unused (less than .3 percent of total drive space—I can live with that).

The *rm* field is used to optimize the throughput to the drive, and for most SCSI drives doesn't matter because you'll be setting the rotational delay to 0ms with *tunefs*, but the specs in the manual say that it runs at 5400 RPM so we'll enter that here. Most drives run at 3600 RPM.

s0 is set to the space to allocate to the file system on this disk, listed as the number of kilobytes. The difference between this number and the total disk size (calculated using *ns* * *nt* * *nc*) is the amount of space reserved for swap and the boot information. For a boot device you should allocate at least 2 MB of space to the bootstrap, plus roughly 50 MB per machine that will use this disk for swap. Swap is used in chunks of 2 MB, so you will want to allocate it in multiples of 2048 to minimize wasted space.

You Can Tune a Filesystem, But You Can't Tune a Fish

Once you have created the new *disktab* entry, you're ready to format the drive just as though it were "supported." This usually includes first running *mediainit* on the drive to exercise all blocks and then using *newfs* to format the drive using the *disktab* entry you created above. Testing the newly created file system with *fsck* is highly recommended.

Most SCSI disks will perform better without any sort of rotational delay. The default is to wait 4 milliseconds between blocks written to the drive. To change this, use the *tunefs* program with the `-d 0` option.

Not all disks will work with HP-UX systems, but so far few disks have been found that don't work. The biggest problem you may run into is disks that aren't able to be made bootable under HP-UX. If *fsck* reports problems during testing of the new drive and you have verified that the *disktab* entry is correct for the drive, it's probably a good idea to abandon that drive in favor of another one. It's simply not worth using a drive that's marginally compatible with the machine. For instance I've heard of drives that will work for a number of hours, then fail.

As always, good backups are important. Especially when using a drive that's not supported by HP, have a good set of backups to remove most of the risk. ◧

Sean Reifschneider (jafo@tummy.com), based in Colorado and currently on long-term assignment in Omaha, Nebraska, specializes in HP-UX systems administration and portable C programming. Mainly he's just enjoying working with computers and the people who work with them.

THE TOTAL SOFTWARE CONFIGURATION MANAGEMENT PACKAGE

VCS provides Software Configuration Management solutions designed to enhance software development in the MPE, Unix and DOS environments. These solutions extend across the entire software cycle from the original analysis, through design, implementation, testing, distribution, and continued maintenance.

Our products are fully integrated to effectively bring order and control to the chaos that accompanies all significant software development. They improve software quality, increase productivity, improve project communication, enforce standards, automate software implementation and distribution processes, provide security and auditing, and report on the entire process from the historical perspective.

Please call to discuss your particular software configuration requirements.

1-800-DOC-VCS-1

Diamond Optimum Systems, Inc.

22801 Ventura Boulevard, Suite 105 ♦ Woodland Hills, California 91364 ♦ (818) 224-2010 ♦ Fax (818) 224-2009

CIRCLE 121 ON READER SERVICE CARD

Confronting

the Unexpected

Handling Exceptions in C and C++

by Frederick F. Chew

Illustration by Matt Foster

Version 3.0 of the proposed ANSI standard for the C++ programming language includes a new feature called exception handling. As of this writing, exception handling is still considered one of the newest features of the C++ language and is implemented in a minority of C++ compilers for all hardware platforms. HP C++ v. 3.0 for the HP-UX operating system on HP 9000 computers is one of the first products to offer exception handling.

What is an exception? An exception is an unexpected error condition that is generally difficult to predict. The following are classical software exceptions:

- Division by zero
- Exhaustion of heap memory
- An out-of-range subscript for an array element
- Exhaustion of storage space during an attempt to write to a file
- A time-out on a request to connect to a computer or peripheral

What do programmers do if any of the above happen? Here are the typical alternatives:

- Ignore the problem: This is fine for routines undergoing change and refinement, but it is unacceptable for production code. Naive, novice programmers often fall into this mode of thinking. They believe that their code is infallible or that users of their routines will instinctively provide the right type of input.
- Exit the program wherever the exception is raised: This alternative is frequently taken in many applications, but this action may not be necessarily correct. For example, if the application fails to get the heap memory it needs and it is in possession of a database lock, it would be unacceptable just to exit without attempting to relinquish the lock.
- Attempt to do recovery or correction: This alternative could be any combination of actions: output a human readable message explaining the probable cause or location of the problem, substitute an invalid quantity with a valid one and continue processing, prompt the user to input a valid entry, continue polling with a new time-out value, etc. Certainly, the action to take depends on the context of the problem.

The specifications of the ANSI C language are almost a proper subset of those for C++ Version 3.0. In the first part of this article, we will examine a number of traditional C language schemes to deal with exceptions and how meaningful they might be under C++. In the second part, we will look at the new exception handling features of C++ and examine how they work.

Traditional C Language Approaches to Error Handling

C language programmers have derived a number of historical schemes to handle exceptions. Here are some of them:

Have the function return a value as the error status. This is simply a normal usage of a typical C function. In the following code sample, the HP-UX routine *open(char *, int)* returns a non-negative integer as a file descriptor if the call is successful, otherwise a value of -1 if the call fails:

```
int flags = O_RDONLY;
int descriptor;
char * filename = "orders.txt";
    ...
descriptor = open(filename, flags);
if (descriptor < 0) {
   printf("Unable to open file %s\n", filename);
}
```

One problem with this traditional scheme is that it cannot be applied to C++ constructors and destructors as such special class member functions by definition cannot return any value.

Incorporate a pointer argument in the function's signature to serve as an output status flag. Since C functions can return at most one value, it is possible to expand a function definition by adding a pointer argument to retain status information:

```
#include <stdio.h>
#define  TABLE_LOCK_NOWAIT  4
     ...
char * data_block;
char * database = "CUSTOMERS";
char * table = "RESERVATIONS";
long mode = TABLE_LOCK_NOWAIT;
int * status = 0; /* initialize the status pointer to zero; assume */
                  /* success unless demonstrated otherwise */
data_block = fetch_bulk(database, table, mode, status);
if (*status == -1) {
   printf("Cannot access table %s of the %s database",
                                        table, database);
}
```

In this example, a user-defined function called *fetch_bulk(char *, char *, long, int*)* is attempting to retrieve a block of records from a certain table of a certain database. If the content of the status pointer is -1, either the table or the database is not accessible with the given mode.

The above approach is fine for traditional C functions (non-member functions in C++) and even for many C++ class member functions. However, users of such functions often fail to initialize the status pointer or check the pointer after the function's completion.

In addition, the scheme above cannot be applied to default constructors and destructors as these special C++ member functions by definition cannot take any formal parameters.

Use a predefined system error handling mechanism. In HP-UX, the use of the global int variable errno and the perror(char *) function is very common. The errno variable is an index to a string (char *) element in the system-defined sys_errlist vector. The perror function will prepend its char * argument to the system error message (namely, sys_errlist[errno]) and output the result to the standard device. The following is a code sample where a parent program attempts to spawn a child process:

```
#include <stdio.h>
#include <errno.h>
char * progname = "Parent";
int child_pid;
child_pid = fork();
switch (child_pid) {
  case -1: {  /* Attempt to create a child process failed */
       char errormsg[512];
       sprintf(errormsg, "%s is unable to fork a child",
               progname);  /* Identify parent */
       perror(errormsg); /* Output errormsg  */
                         /* with sys err information */
```

```
        exit(errno);        /* Exit to the operating system */
                            /* with the errno value */
    }
    case 0: { /* Child process created and */
              /*starts execution here */
        ...
        break;
    }
    default:  {  /* Parent process resumes execution here */
          ...
    }
} /* end switch */
```

One problem with using global variables like errno is that the developer may ignore them. Even worse, since global variables are highly accessible, the result of one error may be overwritten by another routine.

Many error handling routines like perror do nothing more than output the error and leave no alternative but to exit the program. In some situations this is appropriate. However, such routines do not deal with user errors or errors that mandate recovery and continuation of processing.

Use the assert macro. This macro is simply a Boolean test to examine if an expression is true. The assert macro is a tool to pinpoint errors of logic in the development process. The following is an example:

```
class Vector {
public:
     Vector(long);
          ...
private:
     long * vector_ptr;
     long size;
};
Vector::Vector(long init_size) {
assert(init_size > 0); // Pre-condition test to see if the
                       // array size is legal
size = init_size;
vector_ptr = new long[size];
assert(vector_ptr != 0); // Post-condition test to see if there
                         // was enough heap memory
}
```

In the above example, an assert is used to check whether the array size is positive. Another assert is used to verify dynamic memory allocation from the heap is successful. If the expression for either assert is false, the program terminates and a message indicating the nature of the failure appears on standard output.

The use of assertions is based on a contractual model in which the user of code has the responsibility to provide correct input, while the manufacturer (developer) of the code has the responsibility to provide correct output from acceptable input. The discipline of using assertions throughout the C or C++ development effort helps the programmer avoid tacky bugs and pitfalls. Once the code has been thoroughly tested, the assertions can be disabled by adding

```
#define NDEBUG
```

before the #include <assert.h> line near the top of the source file.

As an error handling mechanism, the assert macro will only abort the program if an error is detected. The macro is unable to provide any recovery.

Use the signal() function to set up a handler function. The signal() function is a popular scheme in HP-UX to deal with asynchronous hardware exceptions. It is a part of the ANSI C package represented by the signal.h header file. This package also has a function called raise(), which can be used to deal with synchronous exceptions. The exceptions that are defined in the signal.h file are represented as system-dependent integers such as the following samples:

```
#define SIGINT   2  // Handles the CTRL-C keyboard interrupt
#define SIGFPE   8  // Handles floating point exceptions like
                    // divide by zero
#define SIGABRT 22  // Handles signal to abort
```

The signal() function works by associating the signal of interest with a user-defined handler function. The user-defined handler overrides the system default action whenever the next signal of interest occurs. Furthermore, this association must be re-established with the signal() function within the handler function if the system default action is to be further suppressed. *Listing 1* is a sample program illustrating these points.

The main() routine in *Listing 1* contains a for loop that will loop 10 million times. Before the loop is entered, the signal function is used to substitute a user-defined handler called interrupt_program for the CTRL-C interrupt. The default action where the process is killed is overridden with interrupt_program, which will prompt the user to make a decision to continue normal processing or exit the program. Note that when the index of the loop reaches 9000000, the exception is explicitly raised.

The signal mechanism is best suited for asynchronous hardware exceptions, not the synchronous kind, which is better handled by the C++ exception mechanism. One major limitation of the signal.h library is that most implementations provide no more than two entries for user-defined signals.

Implement a non-local goto with the setjmp and longjmp functions. The setjmp() and longjmp() library functions provide a scheme to pass control back to a previous point of program execution. The setjmp() function saves the current runtime stack environment at the point of the call with a special jmp_buf variable (jmp_buf is really an array of integers that contains the processor's register values). The longjmp() function restores the stack environment and control is returned to the setjmp call. The longjmp call is essentially a non-local goto. *Listing 2* is a sample program with these two functions. The output would be:

```
About to call jmp_routine ...
Function jmp_routine called...
Longjmp has value 5
```

The setjmp() and longjmp() functions are strictly C language library routines and they are not aware of the semantics specific to C++, especially the notions of constructor and destructor. The trouble with setjmp/longjmp is that this scheme bypasses normal block exit. An abrupt jump out of a block means that the destructors for automatic objects will not be called, and hence, such objects will be left undestroyed. The setjmp/longjmp scheme is not recommended for C++ programming.

Introducing C++ Exception Handling

New Keywords: throw, try, and catch

In addition to the early schemes for dealing with errors discussed above, Version 3.0 of C++ offers an exception handling mechanism that is part of its language specification. The language acquires three new keywords: *throw*, *try*, and *catch*. The fundamental idea is that exceptions are thrown within try blocks and caught by error handlers. We will first look at how this mechanism works with a simple example.

Listing 3 shows a *Vector* class that represents an array of longs. Inside the constructor *Vector::Vector(long)*, we do a pre-condition test to verify that the requested size is positive. If the size is acceptable, we will go ahead and call *new* to allocate the required heap memory. We then do a post-condition test to see if the allocation was successful. Note that the keyword *throw* with an expression (i.e., *throw expression*) is used to raise an exception. In the pre-condition test, we throw the built-in type long, while in the post-condition test, we throw a pointer (char *).

The *Vector* class also has an overloaded subscript operator *(Vector::operator[](int))* to return the contents of an array element given its index. If the index falls outside the range, an exception is raised with *throw*.

The context for raising an exception is the *try* block. In the main() function, a pair of braces ({ and }) bound the block with the { immediately following the *try* keyword. At the end of the *try* block are the exception, or catch, handlers. A catch handler looks like a function, but it is not. The catch handler takes at most one argument and returns no value (not even void). At the end of each try block is a list of catch handlers. The list represents those handlers

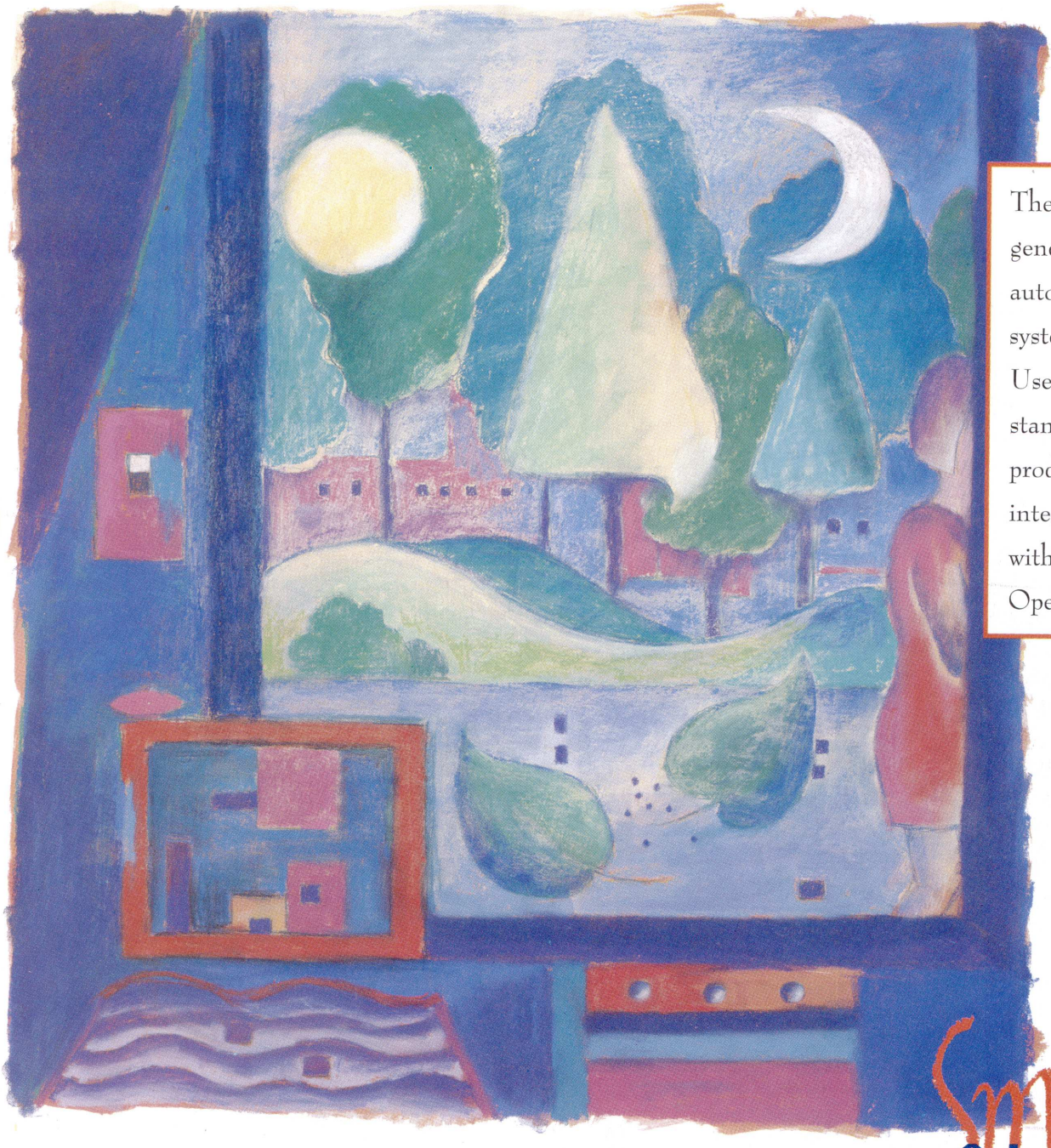
Text Continued on Page 52

LISTING 1 *Using the signal () function*

```
#include <iostream.h>
#include <signal.h>
#include <stdlib.h>

void interrupt_program(int sig) {
char flag;
signal(SIGINT, SIG_IGN);  // Prevent the same signal from
                          // interrupting  processing in the
                          // handler itself
cout<<"Input a 'y' if you want normal processing to continue:\n"; cin>>flag;
if ((flag == 'y') || (flag == 'Y'))
   signal(SIGINT, interrupt_program);  // Reset the CTRL-C interrupt to
                                       // this user-defined handler
else
   exit(0);
}

int main()
{
long index;
signal(SIGINT, interrupt_program); // Set the CTRL-C interrupt to
                                   // handler interrupt_program
for(index = 0; index < 10000000; index++) {
  if (index % 1000000 == 0)
      cout<<"Index is at "<<index<<'\n';
  if (index == 9000000)   // Explicitly raise the signal at this point
      raise(SIGINT);
}
cout<<"Program complete!\n";
return 0;
}
```



The next generation in automated system alerting. Use as a standalone product, or integrate it with HP's Open View.

Smart ALERT

Have SmartAlert watch your system for you.

SmartAlert delivers Operations by Exception for your UX, iX and Novell servers. Using intelligent diagnostics to monitor your system, and sophisticated voice & pager alerting to notify you of critical events, SmartAlert makes sure you always know what's happening on your systems.

SmartAlert's configuration is done through a PC-based Windows interface, and comes with pre-configured libraries and templates to give you an 80% solution right out of the box.

For a free trial, or for more information, call 1-800-263-8787

To receive product information automatically to your fax, call 1-800-CAROLIAN

CAROLIAN Systems

Carolian UK (0)299 403 178 NL (0)2503 20026 D (0)231 758 980 F 1 64 54 82 32 Int'l Fax +1 905 673 7030

CIRCLE 17 ON READER SERVICE CARD

LISTING 2 *Using setjmp and longjmp*

```
#include <iostream.h>
#include <setjmp.h>
#include <stdlib.h>

static jmp_buf environment;  // Declare jmp_buf static so that its
                             // elements are automatically
                             // initialized to zero
void jmp_routine(jmp_buf environment) {  // This function handles the
                                         // error
cout<<"Function jmp_routine called...\n";
longjmp(environment, 5);                 // Return to the setjmp call
cout<<"This line will never be executed.\n";
}

int main(void) {
int value;

value = setjmp(environment); // Will return zero the first time and 5
                             // after longjmp passes control to setjmp.
if (value == 5) {
  cout<<"Longjmp has value "<<value<<'\n';
  return 0;
}
else {
  cout<<"About to call jmp_routine ... \n";
  jmp_routine(environment);
  cout<<"This line will never be executed.\n";
}
return 0;
}
```

LISTING 3 *First example using throw, try, and catch*

```
#include <iostream.h>

class Vector {
public:
  Vector(long);
  long & operator[](int) const;
  ~Vector();
private:
  long * vector_ptr;
  long size;
};

Vector::Vector(long init_size) {
if (init_size <= 0)                // Pre-condition test to see
   throw(init_size);               // if the array size is legal
size = init_size;
vector_ptr = new long[init_size];
if (vector_ptr == 0)               // Post-condition test to see
   throw("Out of heap memory!");   // if there was enough heap memory
}
long & Vector::operator[](int index) const {
if ( (0 <= index) && (index < size) )
   return(vector_ptr[index]);
else                           // Test to see if index is within range
   throw("Array element out of bounds!");
}
Vector::~Vector() {
delete [] vector_ptr;
}

int main()
{
try {
    Vector vec(32767);
}                     // End of try block

catch(long error_num) { // This is the first in a list of handlers
   cout<<"Illegal array size: "<<error_num<<endl;
}

catch(char * error_msg) {
   cout<<error_msg<<endl;
}

catch(...) { // The ellipses...match any built-in type or class object
   cout<<"Unknown exception..."<<endl;
}
return 0;
}
```

that can possibly deal with a raised exception from the preceding *try* block.

In this example, if the precondition test causes an exception to be thrown (a negative or zero array size), the type thrown will be a long. When this happens, the process stack is unwound and the catch handler with the long signature would "catch" and process the exception. On the other hand, if the post-condition test throws an exception, the catch handler with the char * signature would process the exception. If the example were more extensive with throws of floats, doubles, and void *, the *catch (...)* handler would serve as a "default" handler. The ellipses (...) mean that the handler would match any type. However, because of the order in which the catch handlers are listed, *catch(...)* will not deal with exceptions thrown with long or char *. Such exceptions will be caught by the *catch(long)* and *catch(char *)* handlers, respectively.

When we say that the process stack is unwound at the point the exception is raised, the destructors for any instantiated objects or partly instantiated objects will be called. This includes those class objects contained within class objects. This runtime mechanism assures that no garbage will linger in memory.

Matching throws with catches

When an exception is thrown, the throw expression represents a static, temporary object that persists until exception handling has finished. The handler that catches the expression may use this object for notification or recovery. This brings us to the rules regarding how throw expressions match a particular catch handler. They are as follows:

- The type or class object thrown and caught can be an exact match.
- The thrown type is a derived class object and the catch argument is a base class object.
- The thrown type is a pointer type that is convertible to a pointer type that is the catch argument.
- Implicit type conversions of built-in types are *not* applied.
- If there is no matching catch handler, the function *terminate()* is called, which will abort the program.

Suppose we have a class C derived from class B, which in turn is derived from class A. Furthermore, suppose we have a list of catch handlers ordered as follows:

```
catch(...)  // This will catch every throw!
            // Subsequent catch handlers will be totally ignored.
catch(void *)  // This will catch throws of char *, int *, float *,
               // etc. (in fact, every pointer type).
catch(char *)
catch(A)     // This will catch throws of a C object, a B object
             // as well as an A object.
catch(B)
catch(A *)   // This will catch
throws of a C *, B * and A *;
             // however,
catch(void *) came earlier!
catch(C *)
```

It probably would not be very useful to have one or two handlers do all the processing as shown above. A more suitable arrangement would be as follows:

```
catch(B)     // Put the signa-
tures with derived class args
first
catch(A)
catch(C *)   // Then the point-
ers to class objects
catch(A *)
catch(char *)
catch(void *)
catch(...)       // Put me last!
```

Nesting try Blocks

Any body of code can be enclosed within a *try* block. In fact, *try* blocks can be nested within *try* blocks. If that is the case, it is necessary to get an understanding of the flow of control. Let us examine the example in *Listing 4*.

This example has an inner and an outer *try* block. The inner *try* block bounds a function called *Create_Another_Vector(int)*, where the size of an array is passed. Each *try* block must be followed by at least one catch handler.

The *Create_Another_Vector* function is given a bad array magnitude of -1. Within the inner block an exception is raised and a catch handler with a signature of long is sought in the list of catch handlers immediately following the inner try block. The handler that catches the exception is the one labelled <1A>.

Continued

LISTING 4 *Nesting* **try** *blocks*

```
#include <iostream.h>
class Vector {
public:
  Vector(long);
  long & operator[](int) const;
  void Traverse_Vector() const;
  ~Vector();
private:
  long * vector_ptr;
  long size;
};

Vector::Vector(long init_size) {
if (init_size <= 0)    // Pre-condition test to see if the array size
  throw(init_size);    // is legal
size = init_size;
vector_ptr = new long[init_size];
if (vector_ptr == 0)              // Post-condition test to see if
  throw("Out of heap memory!");  // there was enough heap memory
}
long & Vector::operator[](int index) const {
if ( (0 <= index) && (index < size) )
  return(vector_ptr[index]);
else      // Test to see if index is within range
  throw("Array element out of bounds!"); }

void Vector::Traverse_Vector() const {
for (int i = 0; i < size; i++)
  cout<<vector_ptr[i]<<endl;
}

Vector::~Vector() {
  delete [] vector_ptr;
}

void Create_Another_Vector(int asize) {
  Vector vec2(asize);
for (int index = 0; index < asize; index++) vec2[index] = 2.0 * index; cout<<"Elements of vec2:
"<<endl; vec2.Traverse_Vector();
}

int main()
{
try {
  Vector vec1(7);
  for (int index = 0; index < 7; index++) vec1[index] = index;
  cout<<"Elements of vec1: "<<endl;
  vec1.Traverse_Vector();
```

Continued

LISTING 4 *Nesting* **try** *blocks, continued*

```
  try {
    Create_Another_Vector(-1);
  }                    // inner try block

    }
  catch(char * error_msg) { // Handler <2A>
cout<<error_msg<<" in handler <2A>."<<endl;
  }
} // end of outer try block

catch(long error_num) {        // Handler <1B>
  cout<<"Illegal array size in handler <1B>: "<<error_num<<endl;
}
catch(char * error_msg) {      // Handler <2B>
  cout<<error_msg<<" in handler <2B>."<<endl;
}
catch(...) {  // The ellipses...match any built-in type or class object
  cout<<"Unknown exception..."<<endl;
}

return 0;
}
```

However, if we modify the main() function as in *Listing 5*, the handler labelled <1A> is commented out. In this case, no matching handler is available in the inner block, so an attempt would be made to find a handler in the immediately surrounding try block. In this case, the handler labelled *<1B>* would be chosen. If handler *<1B>* were not present, the default behavior would be to call the outer catch handler with the ellipses *(catch(...))*.

Rethrowing an Exception

A catch handler can pass control to another catch handler for further processing. This is the use of the keyword throw without an expression. *Listing 6* is a modification of our previous example.

In this variation of main(), the catch handler labelled *<1A>* uses `throw`; to rethrow the exception with the original long type. Processing passes to the immediately enclosing try block and an attempt is made to locate a matching handler. The matching handler is *<1B>* and *<1B>* will do recovery work by calling *Create_Another_Vector* with a legal array size of 3.

Writing Exception Classes

Built-in types such as long and char * provide limited information for each catch handler to process. A developer can design his own classes for exception objects so that he can code catch handlers that are more informative. In order to avoid name collision, exception classes should not use the term "Exception" as the ISO/ANSI C++ committee is considering a "standard" exception class. *Listing 7* is a followup example of the last program with class *Vector*.

Here the member functions *Vector::Vector(long)* and *Vector::operator [](int)* are modified to throw exception class objects from a framework created with base class *Xception*.

Xception is designed to be an abstract base class with one data member called *actual_value* and a pure virtual member function called *Display()* (which illustrates the type of exception thrown). Using the public inheritance mechanism of C++, three concrete subclasses (*Out_of_Memory*, *Out_of_Bounds*, and *Illegal_Size*) are derived from *Xception*.

The advantage of this approach is that we can built exception classes to deal with specific cases, while putting everything common to all exceptions in one (or a few) base classes. In this

CHANGE OF PLANS !

Change to Plan-B for host-based client/server PC network backup

	Plan-A (THE OLD WAY)	PLAN B
Completeness	"We only back up our PC servers. We don't worry about data on users' PCs."	"Plan-B backs up all our PCs and PC servers, or whichever PCs we specify."
Automation	"Users perform their own backups. We give each one a box of floppy disks and they come to us when they need more."	"We used Plan-B's scheduler to automatically back up our PCs to our HP9000's DDS drive at night."
Convenience	"We have someone who comes in at night and carries a Trakker to each PC and backs them up one-by-one during the night. Users fill out a form if they need a file restored, and our night person restores the file."	"Plan-B backups are done with no user or operator intervention. The PC data is written to tape as part of our HP9000 backup. Users have a program on their PCs which they use to restore any file, any time, in seconds."
Control	"Users are supposed to back up their own PCs. We tell them to put important files on the file server anyway."	"Plan-B meets our auditor's requirements for ensuring that all corporate data is safeguarded."
Integrity	"We are not concerned about data consistency between PCs and the HP9000. Our client/server applications have not been implemented yet."	"Plan-B is the only backup package we found that supports our client/server environment, in which interrelated data is contained on PCs and the HP9000."
Security	"Users keep their backup diskettes in their desk drawers."	"With Plan-B, our PC backups are as reliable and secure as our HP9000 backups."
Performance	"PCs with large disk drives can take a very long time. We tried doing a PC network-based backup but it was way too slow."	"Plan-B's speed blows everything else away, since it uses the horsepower of our HP9000 system and backs up multiple PCs concurrently."

CALL YOUR ORBiT REPRESENTATIVE FOR MORE INFORMATION OR A FREE DEMO

DATA PROTECTION BY

ORBiT

ORBiT SOFTWARE, 315 DIABLO ROAD, DANVILLE, CA 94526 U.S.A. (800) 6-ONLINE or (510) 837-4143, FAX (510) 837-5752

ORBiT Benelux	ORBiT France	ORBiT Germany	ORBiT Italy	ORBiT Scandinavia	ORBiT UK	ORBiT Far East
(Utrecht)	(Nantes)	(Berlin)	(Milan)	(Helsinki)	(London)	(Singapore)
(31) 34 65 53 884	(33) 40 25 16 50	(49) 30 852 70 97	(39) 2 33 41 21	(358) 0 638 450	(44) 372 360333	(65) 227-6959
fax 34 65 54 101	fax 40 25 16 52	fax 30 852 70 35	fax 2 33 41 23 33	fax 0 638 445	fax 372 360305	fax 227-6867

CIRCLE 26 ON READER SERVICE CARD

example, each of *Out_of_Memory*, *Out_of_Bounds*, and *Illegal_Size* has its own implementation of Display(). The *Out_of_Bounds* class even has its own attributes (*lower_bounds* and *upper_bounds*) that it uses in member function *Out_of_Bounds::Display()*.

A well-designed hierarchy of exception classes can be very flexible in terms of the ability to add new exception classes. From the framework of this example, we can derive a new concrete exception class called *Timeout* from abstract base class *Xception*. The *Display()* member function for *Timeout* might make use of the inherited data member *actual_value* by outputting the number of seconds a process has waited for an event to happen.

As the exception class framework grows, its usefulness may apply to many development projects. If that is the case, the developer of the framework can package the exception class definitions into header files and the class member functions into object code library files. That way, clients can make use of the classes and their member functions without concern for their implementation.

Developing Reliable, Bulletproof Code

To summarize, the C++ exception handling mechanism has two goals: (1) error recovery and (2) transfer of control. In the context of how the C++ language is designed and how it is intended to be used, many of the traditional C language techniques fall short of the mark in both areas because of the following limitations:

- Constructors and destructors cannot return any values and hence cannot return any error status.

Text Continued on Page 61

LISTING 5 *Nested* **try** *blocks, Second Example*

```
int main()
{
try  {
  Vector vec1(7);
  for (int index = 0; index < 7; index++) vec1[index] = index;
  cout<<"Elements of vec1: "<<endl;
  vec1.Traverse_Vector();
  try {
    Create_Another_Vector(-1);
  }                      // inner try block
  /*
  catch(long error_num) {   // Handler <1A>
    cout<<"Illegal array size in handler <1A>: "<<error_num<<endl;
  }
  */
  catch(char * error_msg) { // Handler <2A>
    cout<<error_msg<<" in handler <2A>."<<endl;
  }
} // end of outer try block

catch(long error_num) {        // Handler <1B>
  cout<<"Illegal array size in handler <1B>: "<<error_num<<endl;
}
catch(char * error_msg) {      // Handler <2B>
  cout<<error_msg<<" in handler <2B>."<<endl;
}
catch(...) {  // The ellipses...match any built-in type or class object
  cout<<"Unknown exception..."<<endl;
}

return 0;
}
```

LISTING 6 *Rethrowing*

```
int main()
{
try  {
  Vector vec1(7);
  for (int index = 0; index < 7; index++) vec1[index] = index;
  cout<<"Elements of vec1: "<<endl;
  vec1.Traverse_Vector();
  try  {
   Create_Another_Vector(-1);
  }                    // inner try block

  catch(long error_num) {    // Handler <1A>
    cout<<"Illegal array size in handler <1A>: "<<error_num<<endl;
    throw;  // Rethrow the exception with the original long object
  }

  catch(char * error_msg) {  // Handler <2A>
    cout<<error_msg<<" in handler <2A>."<<endl;
  }
} //+ end of outer try block

catch(long error_num) {          // Handler <1B>
  cout<<"Illegal array size in handler <1B>: "<<error_num<<endl;
  Create_Another_Vector(3);
}

catch(char * error_msg) {        // Handler <2B>
  cout<<error_msg<<" in handler <2B>."<<endl;
}

catch(...) {  // The ellipses...match any built-in type or class object
  cout<<"Unknown exception..."<<endl;
}

return 0;
}
```

LISTING 7 *Using the base class Xception*

```
#include <iostream.h>
#include <stdlib.h>
#include <string.h>

class Xception {        // Abstract base class for an exception class
public:                 // hierarchy
  Xception(long);
  virtual void Display() const = 0;
protected:
  long actual_value;
};

Xception::Xception(long some_value) : actual_value(some_value) {
}

class Out_of_Memory : public Xception { // First concrete class derived
public:                                 // from Xception
  Out_of_Memory(long);
  virtual void Display() const;
};

Out_of_Memory::Out_of_Memory(long some_value) : Xception(some_value) {
}

void Out_of_Memory::Display() const {
  cout<<"Heap memory exhausted for attempting to allocate
      "<<actual_value <<" elements."<<'\n';
}

class Illegal_Size : public Xception {  // Second concrete class
public:                                 // derived from Xception
  Illegal_Size(long);
  virtual void Display() const;
};

Illegal_Size::Illegal_Size(long some_value) : Xception(some_value) {
}
void Illegal_Size::Display() const {
  cout<<"Requested Vector size of"<<actual_value<<" is illegal!"<<'\n';
}

class Out_of_Bounds : public Xception { // Third and last concrete
public:                                 // class derived from Xception
  Out_of_Bounds(long, long, long);
  virtual void Display() const;
private:
```

Continued

LISTING 7 *Using the base class Xception, continued*

```
  long lower_bounds;
  long upper_bounds;
};

Out_of_Bounds::Out_of_Bounds(long some_value, long lbounds, long ubounds) :
                Xception(some_value), lower_bounds(lbounds),
                upper_bounds(ubounds) {
}

void Out_of_Bounds::Display() const {
  cout<<"Index "<<actual_value<<" is outside the range from"
      <<lower_bounds<<" to "<<upper_bounds<<'\n';
}

// End of the exception class framework

// Beginning of client application

class Vector {
public:
  Vector(long);
  long & operator[](int) const;
  void Traverse_Vector() const;
  ~Vector();
private:
  long * vector_ptr;
  long size;
};

Vector::Vector(long init_size) {
if (init_size <= 0)                 // Pre-condition test to see if
  throw Illegal_Size(init_size);    // the array size is legal
size = init_size;
vector_ptr = new long[init_size];
if (vector_ptr == 0)                // Post-condition test to see if
  throw Out_of_Memory(init_size);   // there was enough heap memory
}
long & Vector::operator[](int index) const {
if ( (0 <= index) && (index < size) )
  return(vector_ptr[index]);
else                          // Test to see if index is within range
  throw Out_of_Bounds(index, 0, size - 1);
}

void Vector::Traverse_Vector() const {
for (int i = 0; i < size; i++)
```

Continued

LISTING 7

```
  cout<<vector_ptr[i]<<endl;
}

Vector::~Vector() {
delete [] vector_ptr;
}

int main()
{
try  {
  Vector vec1(7);
  Vector vec2(9);

  for (int index = 0; index < 7; index++) vec1[index] = index;
  cout<<"Elements of vec1: "<<endl;
  vec1.Traverse_Vector();

  for (index = 0; index < 9; index++) vec2[index] = 2.0 * index;
  cout<<"Elements of vec2: "<<endl;
  vec2.Traverse_Vector();
}

catch(Illegal_Size & err) {
err.Display();
}

catch(Out_of_Memory & err) {
err.Display();
}

catch(Out_of_Bounds & err) {
err.Display();
}

catch(...) { // The ellipses ... match any built-in type or class object
  cout<<"Unknown exception..."<<endl;
}

return 0;
}
```

- Default constructors and destructors cannot take any formal parameters and hence cannot return any error status via an output parameter.
- Global variables used as status flags can be overwritten.
- Some macros, like assert, can only abort the application when an exception is raised. No alternative processing is possible.
- The signal.h library has at most two entries for user-defined exceptions.
- The setjmp/longjmp technique is strongly discouraged, as the process stack would be unwound without destruction of the automatic objects on the stack.

Some of these traditional techniques will still be useful and can be used effectively if the developer is prudent (for example, the use of asserts to check the quality of the input data to a function as well as its results). What C++ exception handling offers is the following:

- When an exception is raised, there will be a graceful exiting from scope. Existing objects of the scope and partially constructed objects will have their destructors called.
- Error information can now be obtained from the body of a constructor or destructor.
- The C++ throw-catch mechanism will allow class objects to be caught. Developers are free to build their own exception classes so that there is a way to process more information for display or recovery.
- Now, instead of just exiting the application, the developer has the option to do repair and continue the process.

Dealing with exceptions requires careful thought and must be considered early in the design phase of a software project. The list of exceptions that should be handled for a particular application will depend on the problem domain. It may not be appropriate or feasible to handle every conceivable error. However, regardless of where the developer draws the line, he will find that using C++ exception handling requires discipline. That discipline will pay off handsomely with reliable, bullet-proof code that will be easier to debug and maintain. ◧

Frederick F. Chew is a software design engineer in HP's Professional Services division and also a C++ programming instructor in the company's After Hours Education Development Program (HP AHEAD).

REFERENCES

Ellis, Margaret A. and Stroustrup, Bjarne. *The Annotated C++ Reference Manual,* Addison-Wesley Publishing Company, 1990.

Hewlett-Packard. *HP C++ Programmer's Guide,* Hewlett-Packard Company, 1992.

Hewlett-Packard, *Programming on HP-UX,* Hewlett-Packard Company, 1991.

Jas, Frank and Russell, Will. *UNIX System Calls and the C Standard Library,* JR International, 1993.

Murray, Robert B. *C++ Strategies and Tactics,* Addison-Wesley Publishing Company, 1993.

Pohl, Ira. *Object-Oriented Programming Using C++,* Benjamin/Cummings Publishing Company, Inc., 1993.

HP-UX Systems Administration

by Chris Curtin

Series 800 Disaster Recovery

As we saw last month, disaster recovery for the Series 700 is straightforward and documented. For the Series 800, however, there is *no /etc/mkrs* command, as there is for the Series 700, and the way to perform similar functions is not documented.

The Support Tape and Support CD-ROM

Every HP-UX system shipped by HP contains either a Support Tape or a Support CD-ROM. While HP tells you that this tape is for use by their support personnel only, on a couple of occasions I have been instructed by the Response Center to boot it and use some of the utilities when a system has crashed or something else has gone wrong.

Unfortunately, there is no documentation available to end users about what utilities are on the tape or how to use them. In this column I will present some of the basic functionality on the tape and describe how to use the tape to recover a system.

Booting the Support Tape and CD-ROM

The first step in using the support tape is to boot it. When your system begins booting, you will receive a prompt asking if you want to override the default boot path. Press the space bar when this message appears. Do not worry if you miss the message; your system is hosed anyway, so you can just cycle power and interrupt it the next time.

You will now be in the Processor Dependent Code (PDC) for your system. Each release of Series 800 hardware has different utilities available for your use at this point, but we are interested only in the *SEARCH* command. The *SEARCH* command looks at all your hardware and presents a list of all possible bootable disks.

The list is a good starting point for determining what is wrong with your system. If you notice that one or more of your disks or tape drives are not listed, check your cabling. Even an unbootable disk will show up in this list, so a missing disk might indicate a cable or controller problem.

I researched this column using an HP 9000/E55, so what you see when the *SEARCH* command is completed may be different from what I present here. The following is the result of the *SEARCH* command on my system:

```
P0      56/40.1 (dec)   Random Access Media
P1      56/40.2 (dec)   Random Access Media
P2      56/52.0 (dec)   Sequential Record Access Media
P3      56/52.2 (dec)   Random Access Media
P4      60/6.0  (dec)   LAN
```

This system has two external SCSI disks, a CD-ROM drive, a DAT tape drive, and an Ethernet LAN card. The first two entries are the external disk drives; the third entry is the DAT tape drive; the fourth entry is the CD-ROM drive, and the fifth entry is the LAN card.

The easiest way to determine where your tape drive is located is to look for the "Sequential Record Access Media" label in the entry. Since CD-ROM and hard disk drives can be accessed randomly and a tape drive is a sequential device, the P2 entry must be our tape drive. Since the CD-ROM drive is usually on a different bus than

the hard disks, you can locate it by looking for a different second address.

The second field in each entry is the hardware path to the physical device. This path will vary depending on the type of hardware you have. Without detailing the numbering scheme, just know that the first two numbers define the card/slot that the device is attached to and the third number is the address on the bus attached to the card/slot. If you are using an older 800, you may have several levels of addresses.

The next step is to load the Support tape or CD-ROM into the drive. In my case I have a Support CD-ROM, so I loaded it into the CD-ROM drive.

Once the media is loaded, we tell the computer to boot from the Support CD-ROM or tape. (From now on I will use *Support CD-ROM* to mean either the Support Tape or the CD-ROM. If there are any differences between the functionality of the two, I'll point them out.)

To boot the Support CD-ROM, you must tell the PDC where to look for the media. This is where the hardware address listed by the *SEARCH* command is used. In my case I want to boot from the CD-ROM drive so I enter:

```
boot 56/52.2
```

at the '>' prompt. Then I am asked if I want to interact with the IPL; I enter 'y'.

The computer will now try to boot the CD-ROM. This takes only a minute or two with a CD-ROM but may take as long as 10 minutes with some older tape drives.

When the CD-ROM is booted, you will be presented with the ISL prompt: 'ISL>'. (No, I do not know why it says "Interact with IPL" and then gives you an ISL prompt.) From the ISL prompt you can type "HELP" to see what utilities are available from within the ISL. Unfortunately most of the commands are undocumented.

The command we want is *SUPPORTCD* (or *SUPPORT* if you booted a tape instead of the CD-ROM). On a CD-ROM drive this takes a couple of seconds; on some older tape drives it may take several minutes. Next you will be asked for the terminal type you are using as a system console; "a" is for any HP terminals.

Next you get a very nice message from HP about how this is an unsupported utility and that you had better be sure that you know what you are doing. It also comments that this tape is for use by HP support personnel only. Just ignore it and press the return key when it stops scrolling. (You would not be using the utility if something wasn't seriously wrong so do not worry about it.)

Using the Support CD-ROM

Finally you are presented with a menu of options:

```
s - search for file
b - reboot
l - load a file
d - on-line diagnostics
m - display manual page for a specific command
r - recover an unbootable hp-ux system
u - utilities
x - exit to shell
```

The 's', 'l', 'd', and 'u' options are intended for use by HP and are not documented, so I was unable to determine how to use them. The 'm' command allows you to read two manual pages for utilities on the tape: *analyze(1M)* and *disked(1M)*. The first, *analyze*, allows you to look at HP-UX kernel core dumps and *disked* allows you to edit and change specific sections of disk. Use *disked* with extreme caution!

I recommend ignoring everything except for the 'r' and 'x' commands. The 'r' command allows you to make your root disk bootable again. You have three options:

1. Rebuild the bootlif (ISL) and install critical files onto the root file system
2. Install critical files onto the root file system
3. Only rebuild the bootlif (ISL) section.

The bootlif (ISL) is a part of the boot sequence that is executed to locate your kernel. If this information is lost or corrupted, the boot code cannot find your kernel. The critical files options install a basic kernel and basic utilities to allow you to boot your root disk. The three options allow you to install the parts you need.

The 'r' command is the quick and dirty way to make your system bootable. However, there may be times that you need to do something besides replacing the bootlif or installing a basic kernel. If you need to replace the root password, build a new kernel that contains more than a minimum subset of the drivers or *fsck* your root disk by hand; you can start a shell and directly access your disks.

The 'x' command starts a very minimum Bourne shell with only a small subset of the normal HP-UX commands available.

The first thing you want to do is mount your root disk. In the */dev/dsk* directory there are device files for your hardware. If you are using LVM there will be device files that end in 'lvm'. There will be one file per physical disk. First make a new directory:

```
mkdir /mount
```

Next mount the root disk to this directory using

```
mount /dev/dsk/c0d0lvm /mount
```

if you are using LVM, or

```
mount /dev/dsk/c0d0 /mount
```

if you are using disk sections. (Look at the names of the files on your system for the exact device file to use.)

Now you should be able to change directory to */mount* and see your root disk. If you are going to *fsck* the disk, unmount it first, run *fsck*, and remount it to check that the data has been recovered.

To remove the password, edit */mount/etc/passwd* and remove the password field for root. You can also change other files as necessary to get the system to boot. Remember, the Support CD-ROM is intended only to help get the root disk to boot. Do not try to load anything off a tape or do major changes to the root disk until you can boot off the root disk.

Once you have fixed the root disk or made any necessary changes, type 'menu' to get back to the Support menu and select 'b' to reboot the system. You should now have a bootable root disk and the system should at least be able to start the kernel from the root disk.

Unfortunately, most of what I have written about here I figured out by booting the support CD-ROM or having someone from HP walk me through a recovery after a disaster. There are several utilities on the tape that look as if they might be useful, but since I cannot find any documentation for them, I am afraid to try them.

Luckily HP-UX 10.0 is supposed to have a new recovery system that combines the best of the Series 700 recovery system with the Series 800 Support Tape and a new, documented interface. I have not seen this tool, but several people in HP have mentioned it to me while I was researching this column. I'll let you know what I find when I get an update. ◧

Chris Curtin, a software developer for Bradley Ward Systems, Inc. in Atlanta, Georgia, specializes in device driver development for factory automation on the HP 9000. He can be reached via e-mail at: chris@bwilab3.atl.ga.us.

Industry Watch

POWER IS EVERYTHING, SAY IBM, Motorola, and Apple. The big news in the Fall from this high-tech trio was their agreement on a new hardware reference platform for the PowerPC microprocessor. This platform definition provides a framework made up of open technical concepts, definitions, specifications, and interfaces, which the group claims can be used by any hardware or software vendor to build compatible PowerPC-based products. Novell was quick out of the gate with their announcement of plans to provide Processor Independent Netware (PIN) support for the new platform. IBM, Motorola, and Apple say they'll continue to work with other vendors on porting their operating systems to the new platform.

Meanwhile, out at COMDEX '94, Digital was on a power trip of its own, unveiling the new Multia MultiClient Desktop. Dubbed the "power desktop," the Multia MultiClient Desktop is a network-ready device that allows users to run PC, UNIX, and legacy applications simultaneously in a client-server environment. Also announced from Digital that same week was a new Alpha 21066A chip featuring an on-chip implementation of the PCI bus. The company claims this integrated microprocessor will speed up real-time response in high-end embedded applications for higher performance at the desktop.

Serving up its latest performance results, Silicon Graphics claims the world's fastest LADDIS results for their Challenge SMP server. But, then again, so does Sun with their SPARCcenter 2000E. Even so, Digital's AlphaServer 2100 4/275, also announced this Fall, still holds the lead with a SPECint of 189, 47 percent over Sun. SGI hasn't published a SPECRate INT for the Challenge as of this writing. ◧

Industry Watch is written by James. H. Gamble

Xwatch

by Larry Headlund

An Object Oriented Designer

"I CAN'T AFFORD FREE SOFTWARE."

The above seems to be an oxymoron, but reflects the frustration of dealing with some contributed software. I use the term *contributed software* to encompass public domain, CopyLefted (GNU), Berkeley license, X license, and all the other forms of software you get directly from the Internet or from compilations on CD-ROMs. All the software for which the authors don't expect a quid pro quo of money for your use of their work. Those interested in extended, nay interminable, discussions on the differences, characteristics, and fine points of the above should check out *gnu.misc.discuss*, where I can occasionally be seen counting angels on pins.

The primary motivation for contributed software is usually that the program or library or whatever is something the author can use. The first test platform is the author's machine. Depending on the author's interests and needs, it may be ported to other systems. Your particular flavor of machine may or may not be included. Depending on the application and its use of system resources, this can become a major issue or a matter of no importance. By the well-known law, the most interesting application will be the one that is hardest to adapt to your machine.

Historically this has been a bigger problem for HP-UX users than for some others, because a lot of the contributed software is from academic environments, where BSD-derived UNIX reigned supreme. Couple this with the popularity of Sun UNIX boxes, which until Solaris were BSD-derived, and you have a situation where much of the available software has a BSD lineage. HP-UX is of course System V derived. Not V.4, mind you, the current version embraced by SCO, Sun, and Novel, amongst others, but System V.2. Berkeley enhancements yes, but not Berkeley. Proving once again that life is unfair, software developed on HP-UX is usually easy to port to BSD flavors.

The portability problems have been attacked through tools such as imake and GNU Configure, but there is no perfect solution yet. You really cannot fault the developers for not targeting HP specifically. I mean, you could ask for your money back from them, but that would be a pretty sterile transaction.

There are places to get contributed software for HP-UX that has already been ported. There are several ftp sites; there is the Interex Contributed Software Library, and there is even a commercial endeavor that provides HP-UX tweaked code, but sometimes you end up having to do the work yourself.

There are times when the porting work reminds you of the statement that started this column. The question then becomes: Can I justify the time spent on getting this to work, remembering I may not get it to work, or should I just buy a commercial package? The horrible thing, of course, is that you have no one to blame. Not the developers—they are under no obligation to develop code for any but targeted machines. You could blame the disarray in UNIX, but whom do you attack? New Jersey for not following Berkeley everywhere? Berkeley for adding features and not including all New Jersey features as well? Can you say kernel bloat?

You might guess from the above lament that my most recent porting experience was neither carefree nor entirely successful. And you would be right.

Object Oriented Designer

The change to X11R6 brought a needed reorganization of the contrib

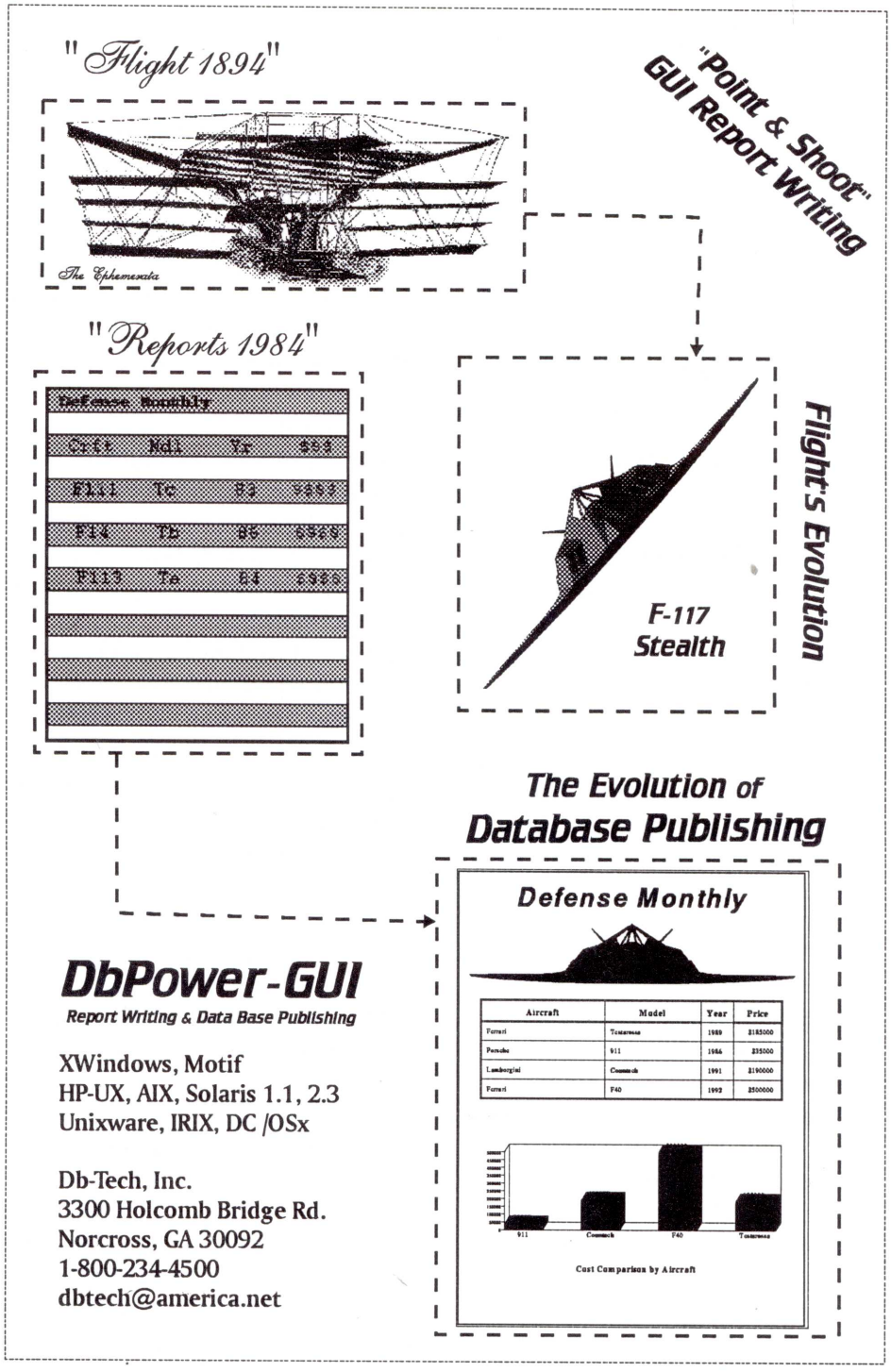
Attention HP Channel Partners

If your company's strategic plan includes tapping into HP's expanding market share, you should seriously consider exhibiting at **Interex '95 — the world's largest exhibit of Hewlett-Packard compatible products and services.**

As a Channel Partner enrolled in HP's IMpact Program, you are now eligible to claim up to 100 percent of the cost of exhibiting at Interex conferences from your co-op account (if all IMpact guidelines are met). If you are not enrolled in the IMpact Program and would like to know more about it, please contact your HP Channel Representative or IMpact Consultant at 408.447.5555 for more details.

interex

The International Association of Hewlett-Packard Computing Professionals



CIRCLE 35 ON READER SERVICE CARD

section of the X archives. The home site is now at *ftp.x.org*. More importantly, the contrib section has been partitioned into games, utilities, etc. This means that when you stop in at contrib to see what's new, you don't have to guess or grab the INDEX to see if that new package is a useful development tool or a fascinating game. (By the way, classification of a package under this new hierarchy doesn't mean you have to have X11R6 to use it. Packages may require only X11R5 or X11R4 or less.) As someone who does software development for a living, I was immediately drawn to the devel_tools section.

One of the first packages parked in this directory was called OOD. Now this really caught my eye. As with all right-thinking people, Object Oriented Design has become my methodology of choice. There are a lot of nice commercial tools to assist OOD. While you can do OOD with index cards and blank paper, or with a general-purpose drawing tool like xfig, an integrated tool has advantages. The most important one, to my mind, is help in keeping design, documentation, and code generation in sync. Most of these tools let you design graphically your objects and their relationships and then generate C++ (or Ada or whatever) code. The code generated is usually limited to header files and simple frameworks, but that alone can be a great help. Some tools will also let you generate SQL statements for creating tables and fields if you are so inclined. Advanced tools will reverse engineer existing code so that you can integrate it into the tool. The only problem with commercial tools is that they can be expensive or unavailable for your platform, and may not be easily extended by the user.

The OOD package seemed to be what the doctor ordered and what made the preacher dance. It was written by Professor Taegyun Kim *[ktg@taejo.pufs.ac.kr]* of the Pusan University of Foreign Studies, Pusan, Korea, for his own use and that of his students in courses in software engineering and systems analysis. He had found the commercial tools too expensive for a university setting. By his own account he has spent over twelve man-months on the effort. He estimates an additional twenty man-months will give him an integrated environment with the flexibility and portability he desires.

OOD follows the Object Modeling Technique (OMT) of James Rumbaugh et al. For those not familiar with this flavor of object oriented analysis, this technique evolved from the Extended Entity Relationship model and hence feels natural to those of us who have been involved with database issues for a long time. There is an excellent book by Rumbaugh and other authors published by Prentice Hall. OOD is an evolving project but currently has the following features:

- A general graphics editor with somewhat limited functionality
- object diagram editor
- C++ skeleton code generation

The object diagram editor is the heart of the application. The general graphics editor is there to support the editor and be a basis for additions, not as a replacement for xfig! The skeleton code generation is for keeping the header files consistent with the design. This is not a tool for doing all of a project by manipulating a GUI.

Documentation

Basically there is no documentation beyond the README and the code itself. This is understandable in that the author's native language is not English and he has appealed to users to supply documentation for distribution. The author does state that the tool seems to be easy enough to use: His students generally master it in a day. Interestingly enough, the application itself is in English. That is, all the labels, headings, and text the application presents are in English, as are the internal comments.

There are some sample applications that have been contributed, so you can load these and see what is possible.

Building OOD

OOD is written in C++ and uses X and Motif. The author lists as a reference *Young's Object-Oriented Programming with C++ and OSF/Motif* and attempts to use object oriented methods throughout. The program comes with a Makefile for modification but no Imakefile. I found it a straightforward job to create an Imakefile and let xmkmf handle the rest of the work. The author's base environment is a SPARC station running OS4.1.x, X11-R5 and Motif-1.2, and C++2.0. He says OOD also has been successfully built on a SPARC using gcc 2.5.8 and libg++ 2.5.3. I found no problems in compiling it with HP's C++.

Using OOD

It was in attempting to *use* OOD that the problems began. On first execution I got a slew of warnings about colors not being found, and the application screen itself was invisible. That is, nothing I typed appeared and my mouse clicks seemed to have no effect.

The warnings about colors were a clue. I checked the code and saw that colors were not set through resource files, or even set all together in a coded array, but were instead buried throughout the code

in calls to a function called getcolor. I rolled up my sleeves and removed all these references so that only default colors would be used. I kept a log of my changes to be used in constructing a resources file later. While rooting around in the code, I saw that all the labels also were hard-coded. This would make it difficult to internationalize! The author uses a clever hack for the titles of widgets, using XtVaCreateManagedWidget(" Printer Name ", ...) to have the default be set to a human readable form. The problem with this is that a name with embedded spaces can make modification and widget naming operations tricky.

With the color problem out of the way, I could see things. The package seemed to be very easy to use and the examples were impressive. But I still was not able to perform essential functions like saving my work or setting a context. A dialogue box would appear, I would type, but no text showed up. I checked again for colors, but no joy. I was trying to find out where the problem was when I gave up. C++ can seem like write-only code. Time pressures wouldn't let me continue fiddling for now.

Conclusion

This looks like a very interesting product. I just wish I could make it work! I think a week of work might do the trick. If anybody picks up the ball, please keep me informed. ◧

Larry Headlund is president of Eikonal Systems and has been working with commercial UNIX since 1982 and with X since 1988. Eikonal Systems distributes Xtty, a software product that allows Motif programs to be run on ASCII terminals such as VT220's. He can be reached at 1.617.482.3345 or lmh@world.std.com.

by David L. Totsch

Scissors and Glue

My children go through so much construction paper that I sometimes wonder if I am not personally responsible for massive deforestation. They have a lot of fun cutting out shapes and pasting them onto things (OK, I envy the fun they have). As for me, I get to cut and paste, too. It is not as much fun, but my medium is not as directly detrimental to trees. If you have been working with HP-UX for long, you have found commands like *cut(1)* to be useful. It has a companion command: *paste(1)*. Just as you probably do more work with scissors than with glue, you will find yourself using *cut(1)* more often than *paste(1)*. In keeping with our adult development, we desire a more sophisticated method for attaching things, so we have *join(1)*. Now that we have the tools, let's work on a project.

Free-form, purposeless art is what my children enjoy most, but, alas, we adults have to identify a need for what we do. Let's say we have a file that contains a list of telephone extensions and the people assigned to them. We also have another file that contains the extension information and the office numbers where the telephones are located.

The files look like this (I am going to show you everything as though it were filtered through `cat -vt` so that tabs appear as ^I):

extensions

```
1840^IBill H.
4025^IKathy W.
5025^IRick S.
7772^IDan K.
```

phones

```
1840^I108
4025^I202
5025^I201
7772^I106
```

The data columns are separated with a single tab. What we want from this is a telephone book that lists the person, the extension, and the office number. Note that both of the files are sorted. If your file is not, use *sort(1)*. To get what I want, I could use the following command:

```
paste extensions phones | cut -c6-
```

to get the following output:

```
Bill H.^I1840^I108
Kathy W.^I4025^I202
Rick S.^I5025^I201
Dan K.^I7772^I106
```

What this does is to take columns of the file *extensions* and merge them with the columns of the file *phones*. The *cut(1)* strips off the leading extension from the

extensions file. Here is another way to accomplish the same thing, but by using the *join(1)* command:

```
join extensions phones
```

and you get the following output:

```
1840 Bill H. 108
4025 Kathy W. 202
5025 Rick S. 201
7772 Dan K. 106
```

Well, we did not get the nice column order we did last time. *Join(1)* can overcome that problem, though (yes, we get something a little more advanced than glue). *Join(1)* will allow us to specify which fields of which file we want to include (and in what order):

```
join -o 1.2 2.2 2.1 extensions phones
```

yields the output

```
Bill 108 1840
Kathy 202 4025
Rick 201 5025
Dan 106 7772
```

Well, we cut off the last name initial, but we have the order that we wanted. *Join(1)* will let us specify the field separator (with the caveat that you cannot specify a different output field separator):

```
join -t "	" -o 1.2 2.2 2.1 extensions phones
```

Trust me, there *is* a tab between those double-quotes. So, we end up with the output:

```
Bill H.^I108^I1840
Kathy W.^I202^I4025
Rick S.^I201^I5025
Dan K.^I106^I7772
```

That works really well, but data is hardly ever perfect. What happens if I remove the entry "Rick S." from the file *extensions*?

```
Bill H.^I108^I1840
Kathy W.^I202^I4025
Dan K.^I106^I7772
```

The *phones* entry for extension 2025 in room 201 was not matched. So, now that we are matching up this information, we want to see unassigned extensions. We can:

```
join -a 2 -e "Unassigned" -t " " -o 1.2 2.2 2.1 \
        extensions phone | cat -vt
```

```
Bill H.^I108^I1840
Kathy W.^I202^I4025
Unassigned^I201^I5025
Dan K.^I106^I7772
```

If we truly wanted an exception report, we would do this:

```
join -v 2 -t " " extensions phones
```

This reports each line of file 2 (*phones*) that cannot be paired with a line from file 1 (*extensions*):

```
5025^I201
```

Join(1) can be really handy, sophisticated glue for your HP-UX projects. Just be careful to sort the input files, possibly with the unique flag turned on (our adult glue requires a little more surface preparation than simple white glue). I did not give an example, but you can also specify which field of the input files to use as the key for the union operation rather than defaulting to the first field of each file. You specify the key to use with the -1 and -2 flags, but I only want to get you interested enough to read the man(1) page and experiment. ◧

David L. Totsch has worked in several different organizations over the past seven years as a system administrator with various flavors of UNIX. At present he is working with HP-UX systems and wide-area networks for a Fortune 100 company in the Piedmont area of North Carolina.

CSL Perspective

HAVE YOU EVER HAD a question from a user that just made you stop and rethink your whole way of doing things? Imagine my surprise when such a question came from four different people in the span of a few days! It was not particularly difficult to answer, but it forced me to stop and think: "Now that I have this CSL library tape, how do I use it ?"

A real tough one, wouldn't your think? As I sat there trying to formulate a thoughtful answer, I began to feel a bit embarrassed. What they wanted to know was not the benefits of the library—we had already convinced them of that. No, they were offering me a challenge to change my thought processes and provide an answer on a different level. You see, what I had not realized was that these users were not software developers who knew how to build programs on HP-UX. For the most part, they found themselves in this environment without a lot of guidance along the way. And there I was, thinking that everyone knew what to do. Bad assumption. I won't make *that* mistake again.

Seriously, though, I would like to apologize to the many users who have had to struggle unnecessarily to use the library software over the years. We didn't intentionally make it into some ritual art that only the initiated could perform. We should be making it as easy as possible for you, not something that you have to work at for years before you figure it out.

So I'll start this month describing what makes up the typical contribution, including some of the major components, and then go on to give you a cookbook-type approach to installing one of the packages.

A CSL release consists of a tape of software. The release naming convention is a carryover from the days when Art Gentry and I were on the CSL/RTE committee. It consists of a four-digit number with the first pair of digits being the year since 1960 (the 'epoch') and the second pair being the week number of the release. Release 3419 is therefore the 1994 release, produced in week 19 of that year.

The tape has files written on it in *tar(1)* format. (Note: *tar* is the program name; the *(1)* is the section of the HP-UX manual or "man" pages where the documentation is found.) Using *tar* to view the contents of the tape is accomplished by the following command:

```
tar -tf {tape device file}
```

You will notice file names such as CONTENTS, INDEX, README, and then a collection of files like f0001.tar.Z. The former are the ASCII versions of the various documentation files for the release itself. The latter are the individual contributions bundled together as separate *tar* files. *tar* is a pretty standard archive utility that will not only create tape archives, but also archives as disk files—sort of like ZIP and ARC on the PC. The 'Z' means that the archive has been compressed using the HP-UX utility of the same name. You might also see files in the library with a 'gz' files extension. This is also a compressed file, but using the GNU *gzip* program instead of *compress(1)*. *gzip* can be found on the 3419 release tape and will be more heavily used in 1995 as the standard compression utility.

The next step, involves a choice. You can dump the contents of the entire tape onto your disk or pick off just a few contributions. If you choose the entire tape, be warned that you need several hundred megabytes of free disk space;

HP-UX stuff tends to be very large indeed. Here are the commands you would use.

`tar -xvf {tape device file}` will dump the entire tape into the current working directory.

`tar -xvf {tape device file} f0001.tar.Z` retrieve just a single contribution.

Next, you uncompress the *tar* file and then break up the archive into its component parts. This can be accomplished easiest using several HP-UX commands connected with a pipe. *zcat* is a shortcut for using *compress(1)* alone and saves some temporary disk space. You will notice several files in the current working directory. The file f0001.tar.Z can be safely removed now since its contents have been broken out.

```
$ zcat f0001.tar.Z | tar -xvf -
$ ls
  README.csl    f0001.tar.Z    imake-5.03.sbmt    imake-5.03.tar
```

The entry named *imake-5.03.sbmt* is called a submit file. Submit files provide the basic information on a contribution including a short description, keywords, prerequisites, and contributor's info. You will find the submit file contained in the printed documentation for easy reference. The production process of the CSL uses the submit file as the key data for building a release. As you look at the submit file, you will find a list of the files that make up the contribution.

The software for this particular program is found in *imake-5.03.tar*. Again, this is just a tar archive as a file, as we noted above. If you were to do a directory of this file with `tar -tf`, you would notice that the file names have a leading subdirectory of the form ./This usually indicates that the tar file was created using a relative path name in the current working directory. If you were to restore this now, these files would be added to your current working directory. With other contributions, the path may still be relative, but with an additional subdirectory such as *llnlxftp.tar* (contribution f0017) with *llnlxftp/* . The other method of saving files is by using an absolute path name. This is not recommended, since you have no control of the ultimate file locations when you restore them. It is always a good idea to check the tar file with `tar -t` before extracting them in case the contributor wasn't careful in how the path was set.

So let's create a subdirectory, and extract the contribution into it.

Here's the series of commands:

```
$ mkdir imake-5.03
$ cd imake-5.03
$ tar -xvf ../imake-5.03.tar
```

As you can see from the contents of the directory, you now have the entire contribution completely unbundled. Now it's time to do a little reading before we proceed. Most contributions come with files of the name README, INSTALL or *.doc. It is always a good idea to consult these files, since you want to ensure a quick and clean install the first time. Note from the directory listing above that this contribution also has a file called README.csl, which contains other useful information. So take a short break; we'll pick up from here next month.

The Denver conference is now behind us, with many memories of packed sessions like the HP-UX Technical Roundtable and busy days on the show floor. An activity that went on behind the scenes was the conference swap tape. We received quite a few contributions this year and think we have a great start for the 1995 release distribution. You can also expect to see many of these in the online library early in 1995. Don't forget to start putting aside your favorite packages for the Toronto Swap; we'll be looking forward to seeing them. ◧

Paul Gerwitz is chairman of the CSL/HP-UX committee and is a technology specialist at Eastman Kodak Company in Rochester NY. He can be reached at 716-477-3067 or by e-mail at gerwitz@interex.org or gerwitz@kodak.com.

1994 DENVER SWAP TAPE INDEX

Name	Title
diff-2.2	GNU diff (file differences)
berkeley-yacc	berkeley-yacc
autoftp	automated ftp scripts for use with MVS
fmp	RTE FMP routines for HP-UX
libnat	RTE library routines in HP-UX native
scsi_info	scsi_info
find-3.8	GNU find
grep-1.6.1	GNU grep
psview-1.41	Postscript previewer
gs-3.0.1	Aladdin Ghostscript interpreter/previewer
gccpackage	gcc package
plan.1.3	Calendar Management
llnlxftp-2.0	LLNL xftp for Motif 1.2
xmcd-1.2	Motif CD player front end
ispell-3.1	Spell Checker for Unix systems
gnuemacs-19.22	GNU Emacs Editor
lynx-2.3	Terminal based World Wide Web Browser
tripwire-1.2	File Security/Integrity Audit
xtar-1.2	xtar-1.2
Mosaic for Windows 3.1	Mosaic-Windows
Mosaic for Macintosh	Mosaic-Mac
xgrabsc-2.3	Capture X-window graphics/save as a file
sudo.v1.3.1	su(1) command with Logging/authorization
uiuc_httpd-1.03	Hypertext Server (Univ of Ill. Version)
cern_httpd	Hypertext Server (CERN Switzerland)
tiger-2.2.3	System security auditing
hpuxsysadmin	Scripts from Marty Poniatowski Denver 94

Product Focus

netVideo

Human Designed Systems (HDS) brings multimedia to X terminals with its HDS netVideo applications and its ViewStationFX Multimedia-capable X Window terminals. HDS netVideo supports analog video—not only real-time decompression, but real-time *compression*, at a full 30 frames per second (fps).

Four specific product components—HDSmovie, HDS netTV, HDStuner, and HDSconference—bring some powerful multimedia capabilities to the X terminal's security and price advantages. Tom Harkins, HDS marketing specialist, observed, "If you look at the price of a multimedia workstation compared to an X terminal, it would be a $2,000 to $3,000 difference. To do a 14-inch, 15-inch multimedia-ready workstation is about $4,000."

By comparison, HDS' ViewStation FX with digital video playback and a 14-inch color monitor would run only $1,598. And the price of HDS' recommended configuration—the ViewStation FX with built-in video hardware, the netVideo software, a camera, and a 17-inch color monitor—is $3,399, still below Harkins' quote for a bare-bones multimedia workstation. This latter configuration enables teleconferencing and multimedia broadcasting and supports digital and analog video.

Harkins acknowledged that other X terminals on the market support digital and analog video, but he added, "If you don't offer applications with it, it's not going to do anybody any good." Other multimedia X terminal vendors offer the ability to set up a camera and transmit video images to a single workstation, but Harkins knows of none that offer video-on-demand over a network. And he knows of no other to employ non-proprietary protocols. "We've always stuck to industry standards," he said. Because of this, Harkins added, HDS can offer features like video windows that can be resized to fit the entire screen.

Although netVideo runs only with HDS' X terminals, the company plans to port the software to other X devices in the future. Based on standards, the ViewStation FX can connect to any UNIX workstation, IBM mainframe, VMS machine, or other computer that supports TCP/IP.

Mike Kantrowitz, HDS' vice president of marketing, added that the software is designed around industry standards for cross-platform development. Specifically, HDSmovie lets the user view video and audio clips stored in standard Windows AVI (audio-video interleaved) format. Kantrowitz envisions developers using this capability to develop training videos on a PC using MS-Windows, then putting these applications on the server for X terminal users to call up in windows on their screens.

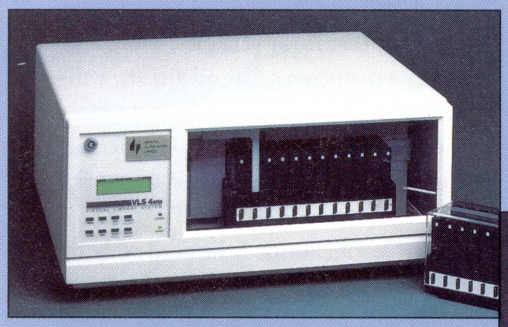
Multimedia Broadcasting

In addition to cross-platform development, use of standards in HDS NetVideo provides the ability to send video and audio over Ethernet or Token Ring. Through the HDS netTV

Why not the BEST?

The BEST Products
The BEST Performance
The BEST Warranty
The BEST Value

Unattended Backup Solutions



Tape Library Autochangers
- HP 4mm DAT, Exabyte 8mm, 3480, QIC, DLT, S-VHS, and AMPEX DST 19mm drives
- Up to 600 cartridges per changer

Autoreply
- Allows any backup program to control Autochangers (TAR, CPIO, DUMP, FBackup, etc.)

QuadraJet
- **Tape Array** controller
- 400% increase in speed and capacity
- Automatic tape mirroring

UNISTORE®
- Unattended backup and Hierarchal Storage Management (HSM) for CA-UNICENTER

Backup Programs for UNIX and Novell
- Omniback and Omniback-Turbo, Hi-Back, Networker, ARCserve, Budtool, DATtool, OpenVbackup, and others

Storage Solutions

Disk Drives and Towers
- Fixed or removable drives
- Fast and Fast-Wide options
- HP disk mechanisms with 5-year warranties

Memory Expansion
- For HP 1000, 3000 and 9000

RAMdisk
- For HP 1000 and 9000

Optical Disk Drives
- Rewritable, Write Once, and CD-Recordable

Optical Disk Autochangers
- 3-1/2", 5-1/4" and CD (Up to 144 cartridges per changer)

Custom Solutions

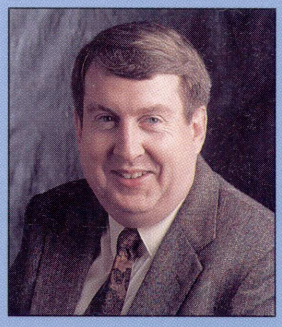
Custom Device Drivers
- For HP 1000 and 9000

Custom Programming
- Consulting and Programming Services

Robotic Control Software
- With API, Interactive, and GUI interfaces

Call with your requirements!

CIRCLE 8 ON READER SERVICE CARD



"I promise you–no service hassles, no matter who is servicing your HP system."
Rick Walsh
CEO

HERSTAL
AUTOMATION
7414 Manatee Street
Sarasota, FL 34243-1824 U.S.A.
Phone: 1-813-358-2001 • Fax: 1-813-358-2010

application, HDS netVideo allows one X Window terminal to "broadcast" video and audio over a standard Ethernet or Token Ring network to other X Window terminals via IP multicasting technology. IP multicasting enables one source to broadcast video information that can be used by one or many workstations/terminals, without generating additional network traffic. Kantrowitz cited an example where a customer uses the NetTV component to provide CNN over the computer network. A VCR is connected to one X terminal, which in turn is converted into a "multimedia broadcast device." Another netVideo user can then bring up a window on his or her desktop screen and view the broadcast.

In addition, HDStuner allows HDS X Window terminal users to connect a cable or antenna directly to their X Window terminal and change channels via a Motif client on the terminal screen. Full-motion video is displayed in a window on the X terminal screen.

The technology enabling real-time compression of video images for TV-type broadcasts is Sun's CELL-B analog video compression algorithm, which converts analog images to digital at 30 fps. Kantrowitz explained that this ability differentiates it from the popular MPEG (moving picture expert group) decompression algorithm, which, although it can play back images in real-time, requires several hours to compress video. Introduced about a year ago, CELL-B has been placed in the public domain.

Video Conferencing Over the Internet

This analog compression technology also enables users to set up a video conference locally or over the Internet using netVideo's HDSconference component. A camera connected to the user's X terminal collects an image that is broadcast to other HDS terminal users. Kantrowitz notes that the conferencing ability will be made cross-platform soon.

"The idea is to integrate everything a user can want at their desktop," Kantrowitz said. Reasons users would want this fairly new technology can be illustrated by current applications. Emergency stations all over the United States have already employed HDStuner and HDS netTV so that police and fire dispatchers can see the emergency location broadcast back to their X terminal screens, enabling them to more accurately dispatch the necessary equipment. In addition, universities have adapted HDSconference for advanced communications between faculty and staff on different campuses. Kantrowitz emphasized, "This is real and available today—it is cost-effective and can be used with computers and networks available today."

Kantrowitz believes the scope of netVideo-based applications is limited only by the user's imagination; the HDS ViewStationFX, currently the only X terminal that supports the software, can be upgraded with up to 132 MB of RAM. NetVideo requires 8 MB of RAM; Kantrowitz recommends 12 MB.

He also recommends that Switched Ethernet be employed in the network to provide 10 mbits/second to each desktop device (he assures users that all standard Ethernet wiring can remain in place; the only thing that changes is the hub, which he said "is not cost-prohibitive").

Basic ViewStation FX terminals include 4 MB of RAM and offer 14- to 19-inch color and monochrome monitors. Prices range from $899 for a 14-inch monochrome monitor with 1,024 x 768 resolution to $3,199 for a 19-inch Trinitron color monitor with 1,280 x 1,024 resolution (a color base with no monitor is also available, at $1,299 for 1,280 x 1,024 resolution, and $1,099 for 1,024 x 768 resolution). Additional memory costs $200 per 4 MB, up to 12 MB.

The multimedia software and hardware extensions are as follows:

HDS netVideo application	$499
HDS ViewCam (video camera with microphone)	$599
HDS microphone	$49
HDS External stereo speakers	$99

Contact Human Designed Systems, Inc., 421 Feheley Drive, King of Prussia, Pennsylvania 19406, phone: (610) 277-8300, fax: (610) 275-5739. ◧

Michelle Pollace is the New Products editor for hp-ux/usr.

Optimizing your HP-UNIX system *today* has a lot to do with predicting how it will work *tomorrow.*

If managing your HP systems seems to involve a lot of guesswork, then involve yourself in the answer — join Interex. As the International Association of Hewlett-Packard Computer Professionals, our collective voice has been actively involved in affecting the future of HP products for over 20 years. And by empowering our members to contribute their ideas to HP product development, it has taken a lot of the guesswork out of predicting the future of their systems.

Protect Your Investment *now.*

In addition to giving our members an opportunity to protect their investment in HP systems, Interex membership offers a number of opportunities to exchange ideas and information with other HP computer users. Any one of which makes Interex membership one of the best investments you can make in your career.

Find out more by calling us at 1.800.INTEREX, e-mailing us at membership@interex.org, or faxing us at 408.747.0947.

interex

Shared Knowledge.
Shared Power.

New Products

Financial Software

Multiview Corporation has announced that Multiview Financial Software for UNIX now includes Accounts Receivable, Purchase Order, and Fixed Assets. Multiview Accounts Receivable for UNIX helps companies manage their receivable assets and credit exposure.

Multiview Purchase Order for UNIX, which is fully integrated with Multiview General Ledger and Multiview Accounts Payable to allow for four-way document matching, helps companies streamline procurement and oversee vendor performance. Multiview Fixed Assets for UNIX helps organizations achieve comprehensive financial, tax, and risk management; create and maintain an accurate asset inventory; and manage property effectively.

Contact Multiview, One Van de Graaff Drive, Burlington, Massachusetts 01803-5171, phone: (617) 229-2225, fax: (617) 229-1635.

Client-Server Accounting

Geac/Collier-Jackson has announced VisionShift Accounting for the HP 9000 series of Precision Architecture-RISC business servers, Microsoft Windows NT servers, and UNIX platforms.

VisionShift Accounting is a suite of general ledger and accounts payable modules developed in Microsoft Access. It combines seamless integration across the enterprise with the ease of use of Microsoft Windows and is fully integrated with Microsoft Office, Word, Excel, and Mail.

The file cabinet interface structure of VisionShift Accounting makes it so easy to learn that users can adapt the software interface to the way they are used to working, the company notes.

Contact Geac/Collier-Jackson, 3707 West Cherry Street, Tampa, Florida 33607, phone: (813) 872-9990, fax: (813) 876-8786.

New from Unison Software

Workload Management

Unison Software has announced Load Balancer 4.01. The key feature in this new release is a recovery mechanism, which is essential for running mission-critical applications in a commercial environment. This mechanism enables Load Balancer to remember what applications and programs were in process prior to system failure.

Load Balancer provides automatic queuing and distribution of jobs across heterogeneous UNIX networks, improving network performance by putting idle computers to work and reducing the load on busy ones. Early users of the release confirmed that the new recovery mechanism does not interfere with the product's performance.

Load Balancer is available for HP-UX and other UNIX platforms. It is priced at $895.

High-Speed Server Backup

Unison Software has announced RoadRunner for UNIX 1.0. With proven speeds of over 40 GB/hour on parallel DAT drives and greater performance on faster devices, the backup utility is the fastest server backup available for UNIX systems, the company notes.

Fast search reads DAT drives 200 times faster than reading tape sequentially. Configurable compression allows the user to specify the type of compression to be used, from none to 4:1, either globally or by fileset. Parallel backup supports up to 16 DAT drives configured for a single system, enabling the system to reach speeds of up to 2.52 GB/hour

PICK A CARD.

Any card. The memory you need is in stock, tested and ready to go. Order today. Upgrade your system tomorrow.

You'll get the quality and service you expect from the leader in HP workstation enhancements. We specialize in HP, it's the platform we know best.

Newport Digital TURBO cards and memory products are guaranteed to meet or beat HP quality standards. Every card we ship has been rigorously tested in a fully functional workstation, just like yours.

Risk free. Our total quality program gives us the confidence to offer an unconditional lifetime warranty. If one of our products fails, we'll ship a replacement by overnight express. We'll do anything we can to keep your workstation working.

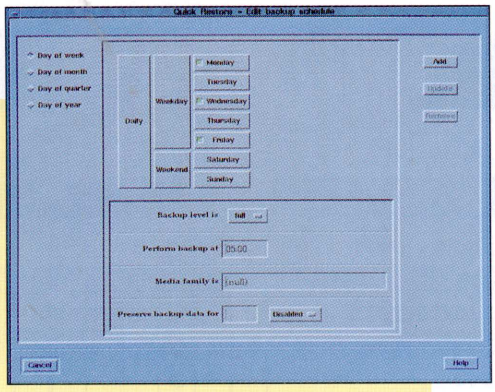
Call Today. Speak with an expert on Hewlett-Packard computers. We'll make sure you get the cards you need.

Evaluate any of our memory products for 30 days. If you're not completely satisfied, return it without obligation.

NEWPORT DIGITAL

1-800-383-3642

CIRCLE 85 ON READER SERVICE CARD



Workstation Solutions Quick Restore

Backup and Recovery Software

Workstation Solutions has announced Quick Restore V2, high-performance data backup and recovery software for the open systems workstation market.

Quick Restore V2 is an ISO-compliant automated backup management system. New features include an easy-to-use GUI, unattended "lights-out" operation, seamless integration with robotic media handlers, and powerful remote-operation capabilities.

The software is said to offer the quickest on-tape data locations performance in the industry. It is available on leading UNIX platforms including HP. It supports popular media formats including 4-mm, 8-mm, and DLT. The company also sells complete systems consisting of software and media.

Quick Restore V2 is available immediately and is priced from $3,500, depending on configuration.

Contact Workstation Solutions, Inc., One Lookout Drive, Amherst, New Hampshire 03031-2800, phone: (603) 880-0080, fax: (603) 880-0696.

for raw disk backup. Data interleaving allows multiple files to be backed up concurrently, thus increasing the speed at which data can flow through the compression module to the media module.

The utility's flexibility allows users to append multiple backups to a single DAT or to use a bank of high-speed tape drives in parallel. When saving to a single DAT, RoadRunner eliminates downtime by moving to drives sequentially as the tapes fill. RoadRunner for UNIX also has an intuitive GUI interface and integrated scheduling capabilities.

RoadRunner for UNIX 1.0 is available immediately on HP-UX and is planned to be released on AIX and Solaris. It is priced at $3,500.

Contact Unison Software, 675 Almanor Avenue, Sunnyvale, California 94086, phone: (408) 245-3000, fax: (408) 245-1412, e-mail: info@unison.com.

Fax Management

Devcom Mid-America, Inc. has announced FaxFX c/s, the client-server enhancement to FaxFX fax management software. FaxFX c/s allows organizations with UNIX-based servers to send faxes from a variety of workstations (clients) including Windows, NT, OS/2, Macintosh, and UNIX. The software provides simple-to-use GUI screens on the PC.

Clients can request a single fax transmission or use phone books for fast broadcasts. Files located on the client machine will be transparently moved to the UNIX server and combined with server-based documents for a single request. Users can receive, view, print, and route faxes, as well.

With the use of FaxFX c/s' API, developers can create and integrate applications directly into the fax system. It will provide support for system login, system status, phone book manipulation, fax submission, fax status, log management, fax retrieval, and image manipulation.

FaxFX c/s server allows virtually an unlimited number of Class 2 Fax modems to be connected for use by the clients, the company notes.

Devcom Mid-America, Inc., 2603 W. 22d Street, Suite 23, Oak Brook, Illinois 60521, phone: (708) 574-3600, fax: (708) 572-0508, e-mail: uunet!devcom!fax-info.

SCSI-2 External Drives

Concorde Technologies, Inc. has introduced new external 1.4-MB, 3.5-inch SCSI-2 floppy drives for HP 9000 computers. These drives provide data interchange with PCs and other workstations using 3.5-inch floppy technology. The drives support both 2HD and 2DD floppy formats and are compatible with most major HP-UX software applications. Versions of the drives are available for the HP 9000 Series 300, 400, 700, and 800.

Concorde's new SCSI-2 floppy drives consist of three basic versions: a single 1.4-MB 3.5-inch drive model with a list price of $795, a dual 1.4-MB 3.5-inch drive model with a list price of $1,495, and an expandable unit that includes a single floppy drive and an expansion bay that may be upgraded with either a hard disk, a CD-ROM drive, or either a DAT, 8-mm, or QIC tape drive. All models include a one-year warranty.

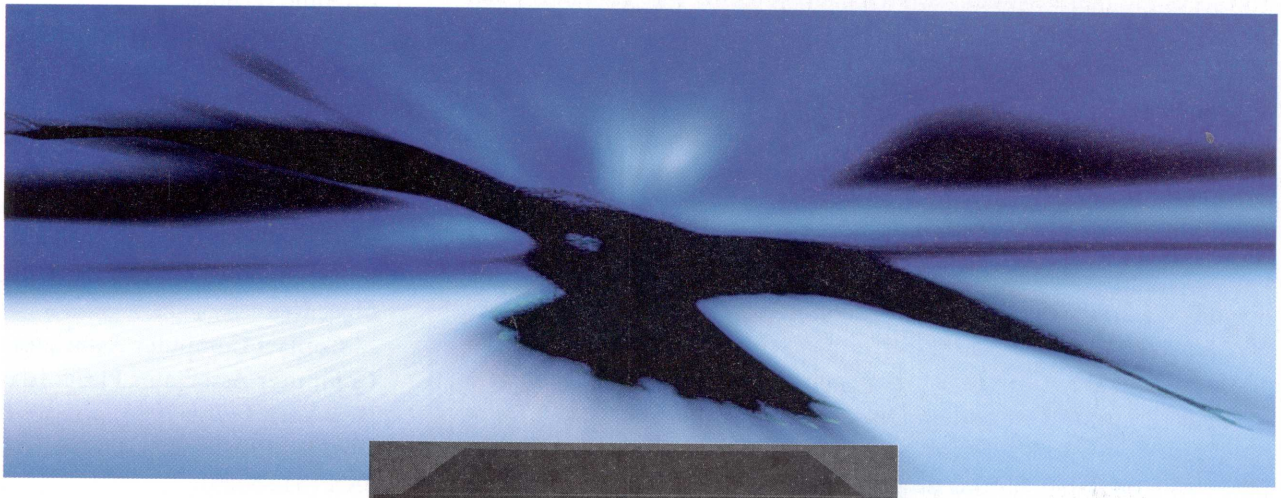
Contact Concorde Technologies, Inc., 6370 Lusk Blvd., Suite F100, San Diego, California 92121, phone: (619) 458-0702, fax: (619) 458-0722.

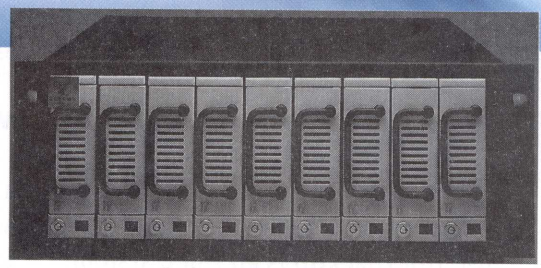
Backup Software

Chevry has announced Interbackup, automated backup software for large UNIX-based client-server networks. Interbackup is object-oriented, with an intuitive graphical interface that makes heavy use of icons and pictures. This software runs as a server on HP-UX and other UNIX platforms. Any UNIX workstation, PC, or Macintosh computer

An open message to all Hewlett-Packard users:

HOW TO GET HP PERIPHERALS AT 190 M.P.H.





Falcon's 18GB disk array

Falcons fly at 190 m.p.h. And when it comes to delivering maximum storage and backup performance for your Hewlett-Packard workstation, so do we. FALCON offers a complete range of disk and tape subsystems; RAID levels 0, 3 and 5; and optical storage solutions from tall to small.

DISKS

18GB, hot swappable, redundant P/S, 8ms disk array (9 Drive Rackmount) $35,995
9GB (Formatted) external drive, 5.25" full height $5,295
4GB (Formatted) 5.25" fast SCSI-2 disk drive. $3,695
2GB Internal Disk Drive..... $1,995

TAPES

Exabyte 8505/8505 XL, SCSI-I and SCSI-II single ended or differential standard 5.25" half-height, uncompressed 7GB, compressed 14GB.....$2,295

FALCONRAID

RAID levels 0, 3 and 5. From 6-to-200GB, hot swappable, hot pluggable, fault-tolerant ..... Call for Quote

FROM YOUNG MINDS

CD-recordable software for Windows, Windows NT, and Macintosh $6,495
CD Studio, includes MakeDisc premastering software, CD studio controller and your choice of a CD recorder..... $18,250

X TERMINALS

NCD X Terminal, 19" color system $3,795
Falcon carries a comprehensive line of monochrome, grayscale and color X terminals.

CALL FOR GSA PRICING

FALCON PSI SYSTEMS, INC.

Making Workstations Work Better

(800) 231-5221

1417 North Market Blvd. Sacramento, CA 95834
(916) 928-9255 FAX (916) 928-9355

Data Analysis

BBN Software Products Corporation has announced significant enhancements to its RS/1 software to improve integration with other applications and data sources in a networked computing environment.

The new Interprocess Communications Interface in RS/1 Release 5.0 enables the exchange of commands, control, and data between RS-based applications and other external applications on remote and local computers. This new functionality facilitates RS/1 integration within a heterogeneous computing environment.

It also provides new data access technology that supports access to multiple sources of data on local or remote computers with a consistent interface. The interface offers an interactive menu system, with options for establishing connections to servers for reading and writing data; and a set of noninteractive RPL procedures used in building applications that perform the same functions as the menu system. This data access technology supports a two-way exchange of data between RS/1 and external applications and data sources.

BBN Software Products has also expanded the range of RS/1 statistical capabilities with new testing procedures for comparing samples, distribution-fitting procedures, dose-response model fitting and comparison, generalized linear modeling, life-data analysis procedures, and an online statistical glossary.

RS/1 provides capabilities to analyze complex data quickly. It combines data management, statistics, graphics, curve fitting, modeling, and report-generating capabilities with a built-in programming language for customizing applications. RS/1 provides a complete graphics system with a full range of capabilities including scatterplots, histograms and three-dimensional displays or completely customized graphs. On workstations and terminals running the X Window System, RS/1 can display graphs in multiple windows.

RS/1 5.0 is available, starting at $2,750 for single-user workstations.

Contact BBN Software Products Corporation, 150 CambridgePark Drive, Cambridge, Massachusetts 02140, phone: (617) 873-5000.

connected on the network can have its data backed up and restored, automatically and unattended, using UNIX-standard tape formats. Backup and restore administration is centralized, but may be initiated by a user, if permitted. Multiple backups can occur simultaneously. Optical disk, 4-mm, 8-mm, stackers, and jukebox backup peripherals are supported.

Custom backup objects can be created using a picture-view of the entire network, allowing for zoom-in views of workstations, directories, and files. A shell command interface offers the option of automatically having shell scripts run both before and after a backup. Interbackup is an open system, allowing systems integrators to have programming access via APIs.

A typical license for a server with 50 clients costs under $10,000.

Contact Chevry, 4764 Park Granada, Unit 202, Calabasas, California 91302, phone: (818) 225-6060, fax: (818) 225-9656, e-mail: philipb@chevry.com.

Reduced Ingres Pricing

Computer Associates (CA) has announced simplified licensing for new and current Ingres clients that cuts license prices, increases levels of standard support by 400 percent, and lowers support costs. CA will make these prices available to CA-Ingres prospects and clients.

While previous Ingres licenses will remain valid, CA expects new clients to favor two new options, one based on the number of concurrent users, the other based on a flat fee for the entire enterprise—both offered in development and run-time versions.

CA's new policy provides the first year's maintenance free.

Like all CA clients, CA-Ingres users are offered free, highly personalized, on-site visits by CA's Client Service Representatives, whose mission is not sales but helping clients use information technology to meet their business objectives.

Contact Computer Associates, One Computer Associates Plaza, Islandia, New York 11788-7000, phone: (516) DIAL CAI (342-5224), fax: (516) DIAL FAX (342-5329).

Manufacturing Software

Cincom Systems, Inc. has announced a series of new client-server applications, as well as two new UNIX platform options for its CONTROL:Manufacturing product line. CONTROL:Manufacturing is a comprehensive business system with integrated applications to support manufacturing, finance, sales and distribution, engineering, and project management functions.

These client-server applications have been developed in cooperation with software partners Microsoft and Oracle, as well as with hardware partners Digital, HP, and IBM.

Cincom's first client-server products are workbench and decision support -

Past. Present. Future.

Timeless Solutions from API International

Only from API International can you find a full array of products that will withstand the tests of time and technology.

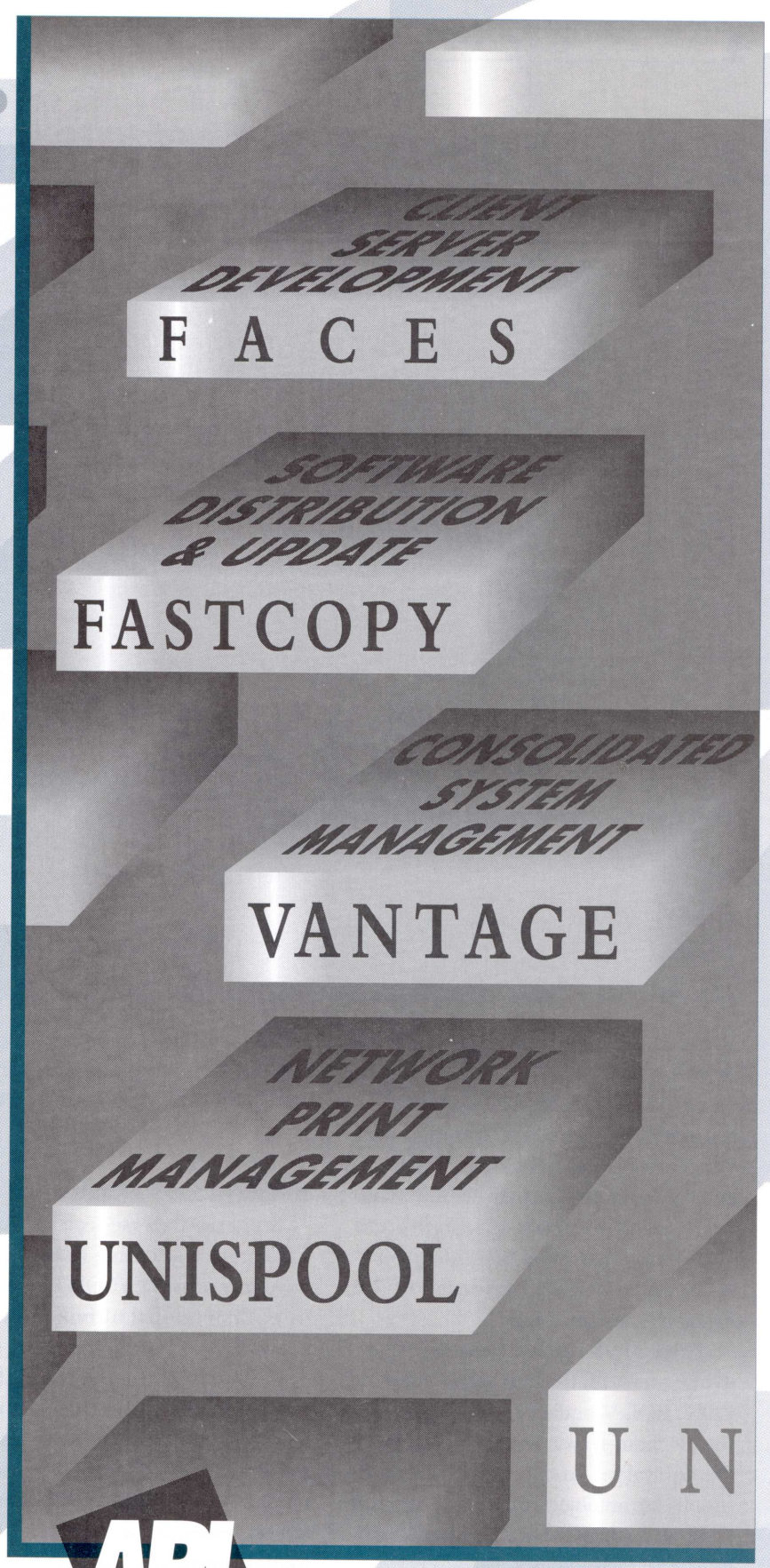
Flexibility to integrate your current technology investments without re-engineering.

Simple to install and learn, protecting your productivity and mission critical demands.

Durable to meet the automation changes and challenges of future advancements.

API International—here to stay and solve all your enterprise computing needs.

Discover how you can save with simple solutions from API International.



UNISPOOL is a trademark of Holland House bv

Call 512.280.4391.
Or, fax for more information
512.280.0309

API International

CIRCLE 9 ON READER SERVICE CARD

Test Case Generation

Interactive Development Environments (IDE) has announced StP/T, a new version of its T test case generator. Available immediately, StP/T is designed to dramatically improve software quality and productivity, because it lets developers automatically test software code against the functionality they specified in the analysis and design stages.

Working with IDE's StP/OMT object-oriented modeling tool and StP/SE structured analysis and design tool, StP/T automatically extracts test information, generates multiple test cases, and formats these cases for use by test execution tools. St/T can create up to 300 test cases per minute. Through its link to analysis and design tools, StP/T builds test cases directly from specifications outlined in the application's data and object models. This enables test engineers to test whether the code actually performs as specified.

StP/T features an open interface based on the IEEE 1175 standard, which allows input from other analysis and design tools.

StP/T automatically creates a test for every function according to a number of design test techniques: Functional Analysis, Boundary Value Analysis, Equivalence Class Analysis, State Directed Testing, and Event Directed Testing. It generates test cases in ASCII text format, which enables these cases to be executed across multiple software languages and hardware/operating system platforms.

Available immediately for Sun SPARC systems running SunOS and Solaris, StP/T is priced at $12,000 per license. Future platforms include IBM RS/6000s, HP 9000 Series 700 and 800s, and Digital Alpha workstations.

Contact IDE, 595 Market Street, 10th Floor, San Francisco, California 94105, phone: (800) 888-4331 or (415) 543-0900, fax: (415) 543-0145.

applications. Cincom is targeting these new products at discrete manufacturers—in particular, manufacturers of highly-engineered products with customer-driven variation by contract, project, or order. The three new products are Cincom's *Configuration Workbench, Production Scheduling Workbench,* and an ORACLE version of the *Enterprise Analyst Series.*

These products have been developed to integrate with the host components of CONTROL:Manufacturing as well as with future client-server implementations of the equivalent functions. All new applications use an object-oriented design, full GUI, and industry-standard platforms, tools, and technologies.

Cincom has achieved Hewlett-Packard's "Premier Solutions Provider" status for CONTROL:Manufacturing.

Contact Cincom Systems, Inc., 2300 Montana Avenue, Cincinnati, Ohio 45211-3899, phone: (513) 662-2300, fax: (513) 481-8332.

Turbulent Flow Analysis

Structural Research & Analysis Corporation and Blue Ridge Numerics have announced FLOWPLUS 3D for three-dimensional turbulent fluid flow analysis.

FLOWPLUS, introduced in 1993 as a full integration of Blue Ridge Numerics' Computational Fluid Dynamics (CFD) software within Structural Research's COSMOS/M finite element analysis (FEA) system, now supports 3-D tetrahedral, prism, and hexahedral elements, as well as 2-D quadrilateral and triangular elements to model planar axisymmetric and 3-D geometries.

FLOWPLUS solves for velocity, pressure, temperature, and turbulence. It can include natural, forced, and mixed convection effects for thermal analysis, as well as specified pressure boundary conditions to solve pressure-driven flow problems. FLOWPLUS results can be passed easily to other COSMOS/M modules for further analysis, due to its full integration within COSMOS/M.

FLOWPLUS is available for 386 and 486 PCs and compatibles, as well as engineering workstations that include the HP 9000 Series 700.

Contact Structural Research & Analysis Corporation, 2951 28th Street, Suite 1000, Santa Monica, California 90405, phone: (310) 452-2158, fax: (310) 399-6421.

X/Open Publications

X/Open has announced a new, worldwide distribution agreement with Prentice Hall, a unit of Simon & Schuster. Under the agreement, X/Open titles, covering technical specifications for open systems and management information about emerging technologies and business issues, will be distributed by Prentice Hall through retail/wholesale and library sales channels worldwide.

The agreement, effective immediately, will initially cover 12 titles, including the single UNIX specification, the XPG4 Base specification and systems management protocols, and the business managers' guide titled *Change Management and the Momentum of Open Systems.*

Prentice Hall will also distribute a range of X/Open CD-ROM publications in a shrink-wrapped package with a companion volume containing a contents overview. Individual CD-ROMs will cover an X/Open specification set and will be available through bookstores.

In addition, the agreement encompasses the development, commissioning, and publishing of new titles. All titles will carry both the X/Open and Prentice Hall brands.

A full listing of X/Open publications can be obtained from Anita McClelland at phone: (+44 734) 508311, ext. 2229, fax: (+44 734) 500110.

Hierarchical Storage Management

Advanced Archival Products, Inc. (AAP) has announced AMASS-DataMgr hierarchical storage management software support for HP 9000 Series 700s and 800s. The software provides transparent file migration and the ability to directly access optical disk and/or tape libraries.

During file migration, AMASS-DataMgr automatically makes space available when a magnetic disk's file system begins to fill or when user-defined migration criteria are met. It assesses the status of files and, based on the system administrator's criteria, transparently moves the identified files to less costly storage such as optical jukeboxes or tape libraries. To the application, migration files still appear to be present and are transparently retrieved when accessed. The software may be configured for server or client-server operation and runs as a layered product on AAP's AMASS file system.

AMASS is the only direct access jukebox file system to provide a single device, single unlimited file system view of jukeboxes of all sizes and media types. AMASS-DataMgr supports 19 different manufacturers of optical and tape libraries, from gigabytes up to hundreds of terabytes. It is also available as an upgrade to existing AMASS customers.

Contact Advanced Archival Products, Inc., 6595 S. Dayton Street, Suite

Enclore Plus RTH

Storage Systems

ANDATACO has announced Smart Storage, a line of disk and tape storage products that are faster to install, easier to use, and simpler to upgrade than conventional storage systems, the company notes. Smart Storage is achieved through the development of software and SCSI-based hardware technologies that are built into these systems.

A SCSI Processor Module enables the peripheral to perform such functions as mirroring, RAID level 0 or 1, and caching. This processor provides performance and function enhancements without the need for custom device drivers and without operating system dependency.

Smart Storage products include: Entree Disk subsystems, GigaRAID Tower and Rackmount systems, Encore and Encore Plus Tape subsystems, and Encore Plus Robotic Tape Handling (RTH), systems. Smart Storage products also have one or more software tools built in: SCSI Bus Management Tool (SBMT), RAID Management Utility RMU), Robotic Tape Handler (RTH) and ANDATACO System Analysis Program (ASAP).

SBMT is a GUI-based utility for identifying, configuring, and managing SCSI peripherals on a UNIX system.

RMU is a GUI-based software tool that enables ANDATACO GigaRAID systems to be automatically tuned and configured for specific applications. RMU also provides remote error notification via e-mail. RTH is a combination of software and hardware that controls ANDATACO 4-mm and 8-mm Robotic Tape Handling Systems. ASAP is a tool to collect, view, and analyze vital system statistics and identify opportunities for system enhancements.

Contact ANDATACO, 10140 Mesa Rim Road, San Diego, California 92121, phone: (619) 453-9191 or (800) 334-9191, fax: (619) 453-9294, e-mail: inquire@andataco.com.

1200, Greenwood Village, Colorado 80111, phone: (303) 792-9700, fax: (303) 792-2465.

Configuration Management

Tower concepts, Inc. has announced that Razor software now supports HP-UX and Silicon Graphics Inc.'s IRIX under the Motif GUI. Razor is an integrated tool suite for software developers, combining a tailorable issue tracking system with traditional version control and build coordination capabilities. Razor is already installed worldwide running under the Solaris and SunOS operating systems.

GlobalTrack, a new distributed processing software module for Razor, permits development teams in different geographic locations to easily coordinate their activities, priorities, and objectives through synchronized issue tracking databases.

Razor is priced at $495 for a single floating license. Prospective customers may obtain a Razor manual by sending e-mail to razor-manual@tower.com. Sites with direct Internet access can obtain an evaluation copy from ftp.uu.net.

Contact Tower Concepts, Inc., 103 Sylvan Way, New Hartford, New York 13413, phone: (315) 724-3540.

Failover Management

Qualix Group, Inc. has announced FirstWatch 2.1, with additional server support for Hewlett-Packard's HP-UX 9.0 operating system running on HP 9000 Series 800 servers. FirstWatch is a high-availability failover management software for UNIX servers.

The software provides failover management for systems, applications, and services, thus increasing the integrity of both the data and the network. It provides automated failure detection, recovery, restart, and failover services for any type and size network. The product is designed for customers who require 99 percent or higher uptime of their critical operations.

Version 2.1 was recently released with additional features that include multi-machine failover; compatibility with Sun's new SPARC Storage Array; and failover monitoring agents for Sybase, Oracle, and Informix databases.

FirstWatch 2.1 has been verified to function seamlessly with the Veritas XvM volume manager. The software also supports SunOS 4.1.3 and Solaris 2.2/2.3 operating systems.

The FirstWatch base product is priced at $14,995 per server pair. FirstWatch along with two days of free configuration and installation consulting on-site costs $24,995. The product and three days of free configuration and installation consulting on-site costs $36,495. Qualix also offers 24-hour, 7-day support.

Contact Qualix Group, Inc., 1900 S. Norfolk Street, #224, San Mateo, California 94403, phone: (415) 572-0200, fax: (415) 572-1300, e-mail: info@qualix.com.

New From Four Seasons Software

Application Development

Four Seasons Software has announced SuperNOVA 4.0, the latest release of its database and platform-independent application development environment.

Available immediately, SuperNOVA 4.0 includes dynamic partitioning, for automatic distribution of application functions and objects to all clients, servers, and platforms in a distributed computing environment; an application controller for servers, for automatic switching and selective routing of functions and objects; increased performance, for the highest transaction throughout with a reduction in the computer resources required; added database support, including DB2, Sybase System 10, Oracle Version 7, Dbase III and IV, FoxPro, Clipper, and Btrieve tables; improved GUI builder functionality, such as new toolbars, viewers and viewboxes; accelerator keys; and multi-dimensional portability.

SuperNOVA 4.0 is priced starting at $2,200 per developer and is available on Windows 3.1, Windows NT, and most UNIX machines.

TUXEDO Object

Four Seasons Software, Inc. has also announced a strategic marketing alliance with Novell, Inc. to promote the use of Four Seasons' SuperNOVA and Novell's TUXEDO OLTP technology for mission-critical client-server environments.

Four Seasons Software is introducing a TUXEDO object into its extensive

Lantronix MPS1

Mini Print Server

Lantronix has announced a very small, single-printer version of the EPS1. The new MPS1 is compatible with five protocols: IPX (Novell NetWare), TCP/IP (UNIX), LAT (DEC), AppleTalk (Macintosh/EtherTalk), and NetBIOS/Net/BUEI (LAN Manager/Windows NT).

The printer server unit can service multiple print jobs using any of these protocols. It also supports HP Bitronics mode (bidirectional) operation, and is SNMP compatible.

Two versions are available. Both provide a single Centronics-compatible parallel printer port and plug directly into the printer. The MPS1-2 has a BNC thin coax (10BASE2) connector for the network. The MPS1-T has a RJ45 unshielded twisted pair (10BASE-T) connector. The units are Flash ROM-based and the software can be easily upgraded. These software updates are free and may be accessed through Lantronix bulletin board service or through the Internet.

The MPS1 is priced at $399 and is supported by a five-year limited warranty. Lantronix is slashing the price of its current multiprotocol print server line by $200. The new prices are $495 on the EPS1 and $595 on the EPS2. Providing identical functionality to the MPS1, the products offer one serial and one parallel port (EPS1) and one serial and two parallel ports (EPS2).

Contact Lantronix, 15353 Barranca Parkway, Irvine, California 92718, phone: (714) 453-3990, fax: (714) 453-3995, e-mail: sales@lantronix.com.

object-oriented fourth-generation language. This allows application developers to achieve application logic partitioning across multiple servers, without writing 3GL code. By creating SuperNOVA 4GL server objects such as batch reports, financial transactions, and net present value calculations, developers for the first time can achieve the productivity levels on servers they are accustomed to on PCs, Four Seasons notes.

Contact Four Seasons Software, 2025 Lincoln Highway, Edison, New Jersey 08817, phone: (908) 248-6667, fax: (908) 248-6675.

Mainframe-Class Storage

The Spectra Logic division of Western Automation has announced the TapeFrame T4000, a rack-mounted, modular tape storage system comprised of two, four, six, or eight of Spectra Logic's Spectra 4000 (4-mm) tape libraries. Each library contains four DDS-2 tape drives, slots for 58 tape cartridges, and a barcode scanner to read tape labels. The total capacity of the TapeFrame T4000-800 with eight libraries is 4.6 terabytes (assuming a 2.5:1 compression ratio using DDS-2 drives' built-in LZW compression), 1.9 terabytes native.

A TapeFrame T4000 with eight libraries contains 32 tape drives each capable of sustaining a transfer rate of 510 to 1,275 K/seconds. The modular design allows an entire tape library to be "hot-swapped" on many systems without turning off the UNIX server to which it is attached.

Future TapeFrame systems will use 8-mm, Exabyte EXB-8505XL drives, as well as DDS-3 and Exabyte "Mammoth" drives when that technology becomes available.

The T4000 (DDS-2) can be upgraded to a T5000 (DDS-3) for a projected 7 terabytes of uncompressed storage; the T9000 (EXB-88505XL technology) TapeFrame can be upgraded to a T10000 (8-mm Mammoth technology) system for a projected 6.4 terabytes native (12.8 terabytes compressed) on 8-mm tape.

U.S. list prices start at $86,400 for a T4000-200, dual library, 116-cartridge, eight-drive configuration (all TapeFrames include differential SCSI data paths, barcode readers, and dual Ethernet ports for redundancy). A T4000-800 eight-library, 32-drive, 464-cartridge configuration is priced at $285,600.

Contact Spectra Logic, 1700 North 55th Street, Boulder, Colorado 80301, phone: (303) 449-7759, fax: (303) 939-8844, e-mail: library@spectra.wali.com.

WAN Front End

ACC Systems has announced its latest Wide Area Network front end, the WANstation. The company has been working closely with HP to provide the best approach for attachment of Wide Area Networks to HP systems. The new offering allows HP users to connect to X.25, or DDCMP, or a number of other standard protocol-based services. Because the WANstation can be reprogrammed for special applications, all types of data traffic can be serviced, including unformatted streams of information, the company notes.

Up to now, HP communications involved the combination of EISA bus

adaptors and third-party interfaces. By attaching to the SCSI bus, the WANstation is platform-independent.

The WANstation is designed to support HP-UX, Solaris, DEC/ULTRIX, and OpenVMS operating environments. Protocol support for the WANstation is anticipated for X.25, HDLC, DDCMP, and ASYNC. Device driver support will include IP, PAD, X.29, and Programmers Interface.

Contact ACC Systems, 414 East Cota Street, Santa Barbara, California 93101, phone: (805) 963-8801, fax: (805) 966-9725.

Color X Terminal

Phase X Systems has announced a new family of affordable color X terminals, the "L" series. This new line also features color 15-inch and 17-inch X terminal systems supporting both 1,024 x 768 and 1,152 x 900 resolutions.

The L series X terminals are based on the TMS340X Graphics Processor running at 40 MHz and come standard with 4 MB of memory, upgradable to 16 MB. Thick, thin, and twisted pair (optional) interfaces and a serial port are provided for easy printer connection. The 1,024 x 768 resolution, .28-dot pitch, 14-inch color version features a unique design with the X terminal system board built into the monitor chassis. The Energy Star compliant 15-inch and 17-inch monitors have a .28 and .26 dot pitch, respectively, and will support both 1,024 x 768 and 1,152 x 900 resolutions.

Along with a full local Motif window manager, the L series' optimized X11R5 server provides easy, streamlined installation. Supported network protocols include TCP/IP, Telnet, NFS, TFTP, RARP, BOOTP, SNMP, SLIP, and PPP.

Along with the $995 14-inch color

Global Manufacturing

ESI/Technologies has announced Version 8.0 of its Enterprise Management Information System (EMIS), ESI's family of fully integrated manufacturing, distribution, and financial applications. EMIS 8.0 features the advanced functionality of event-triggered requirements planning. Other key enhancements include activity-based cost management, an executive information system, and dynamic finite scheduling.

EMIS 8.0 is comprised of 18 fully integrated manufacturing, distribution, and financial modules. EMIS was developed in the ORACLE 7.0 native environment in order to take advantage of all ORACLE database features and multiplatform flexibilities. EMIS is based upon open systems, relational and client-server technologies, and offers multicompany, multilingual, and multicurrency capabilities.

New, comprehensive "just-in-time" capabilities of the Event-triggered Requirements Planning feature deliver concurrent, continually updated information throughout the enterprise. EMIS 8.0's Activity Based Cost Management module enables a company to identify the costs each product consumes in an online, real-time format. The Executive Information System module, designed to deliver strategic information from the EMIS database to the company's decision makers, obtains and displays a snapshot of the state of the business in a summarized graphical format. The Dynamic Finite Scheduling module for controlling projects, work phases, and resources optimizes lead times by checking flow against resources and improves resource use by detecting bottlenecks and idle capacity.

A unique feature of EMIS 8.0 is that its database triggers from the ORACLE 7.0 server. By accessing transaction logic, the system "learns" frequently used input patterns. EMIS 8.0 also offers dialogue boxes for archiving selection and flexibility, plus a global on and off help feature.

EMIS 8.0 is available on ORACLE 7.0 and all major platforms. EMIS modules may be purchased individually or as a fully integrated system. Complete system prices range from $80,000 to $600,000, depending on modules purchased and number of users.

Contact ESI/Technologies, Rand Building, Seventh Floor, Buffalo, New York 14203, phone: (716) 852-8000, fax: (716) 845-5301.

Model 14CL, the color 15-inch (15CL) is priced at $1,195, and the 17-inch (17CL) is priced at $1,595 per unit. The X terminals come complete with keyboard, monitor, and mouse. Support includes a complete one-year hardware and software warranty, free installation support, a free lifetime support hotline, and a 30-day, risk-free purchase policy.

Contact Phase X Systems, Inc., 19545 NW Von Neumann Drive, Suite 210, Beaverton, Oregon 97006, phone: (503) 531-2400, fax: (503) 531-2401, e-mail: jack@phasex.com.

VMS to UNIX Migration Services

Accelr8 Technology Corporation has announced a complete set of migration services for moving applications and data from a DEC VAX to HP, SUN, and DEC UNIX workstations.

The first phase, situational analysis, assesses the feasibility of a customer's migration. The customer's current system is broken down into discreet, manageable modules. Porting strategies are then identified for each module and combined into a porting plan. The second phase, implementation planning, establishes a plan of action based on the customer's migration requirements as determined by the situational analysis. Actual migration of applications and data to UNIX take place during the staged conversion phase and utilize Accelr8's time-tested porting tools. A replacement cycle gives customers the option of a partial or complete conversion. Finally, the certification process validates the acceptance criteria determined by the implementation planning and the system is handed off to the customer.

Contact Accelr8 Technology Corporation, 303 East 17th Avenue, Suite 108, Denver, Colorado 80203, phone: (303) 863-8088, fax: (303) 863-1218.

System Administration and Management

Boole & Babbage, Inc. has announced Ensign, a new suite of UNIX system administration and management tools focused on simplifying, automating, and optimizing a UNIX administrator's essential everyday tasks. This approach is unlike most competing products, which either specialize in one or two application areas such as performance measurement or database administration or require a significant user investment in installation and implementation, the company notes. Ensign is said to be the only tools suite to enable simultaneous control of the same UNIX systems from a central data center and a remote site location by different levels of staff.

The new Ensign Central Manager and Ensign Alarm Manager were developed from the client-server technology acquired with Oslo-based Sysnet Corporation earlier in 1994. A third product, Ensign Local Manager, is being significantly enhanced.

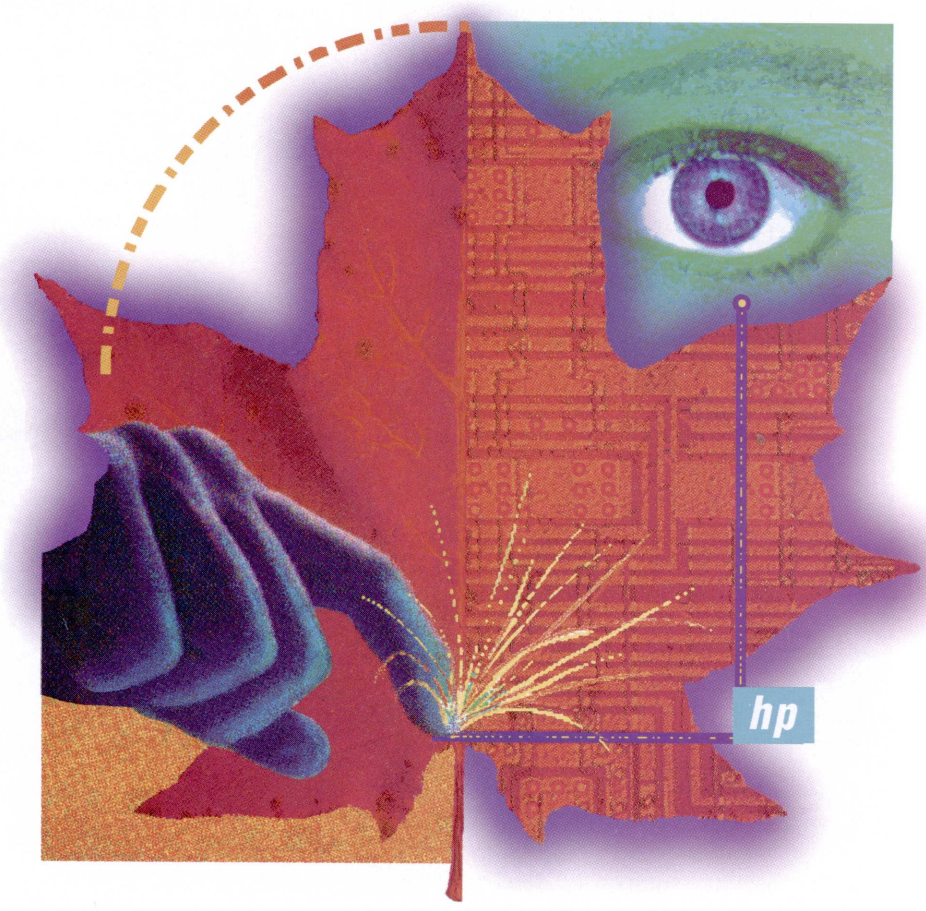
Continued

Set your sites for Toronto, Ontario

Metro Toronto Convention Centre

Interex '95 Conference & Expo

AUGUST 14–18



New in 1995!

The Interex Conference & Expo, the premiere conference for HP computing professionals, is getting even better. The Interex '95 Conference & Expo in Toronto will include a one-day Management Symposium (formerly Executive Interex), focused on strategic management issues for long-term technology planning. The Management Symposium will provide you with the authoritative and objective information you'll need to successfully manage technology in a complex and competitive global economy.

And what's more...

The program has been planned so that Management Symposium attendees will also be able to attend the Interex '95 general conference sessions and keynotes, meet with top-level HP management, and have access to the hundreds of exhibits at the Expo, saving you months of product review time.

hp interex

Future Conference Dates

Interex '95 Programmer's Forum (IPROF)
April 5 – 8
Cupertino, CA

Interex '96 Conference & Expo
August 4 – 8
San Diego, CA

Interex '97 Conference & Expo
August 24 – 28
Chicago, IL

Graphical Instrumentation

National Instruments has announced the port of its LabVIEW graphical instrumentation software to HP 9000 Series 700s. LabVIEW 3.1 for HP-UX is compatible with the versions of LabVIEW 3.1 on Windows PCs, Macintosh computers, and Sun SPARCstations. Its graphical compiler takes advantage of the high-performance PA-RISC architecture. LabVIEW for HP-UX can communicate with other applications, such as those written in HP-BASIC.

Enhancements include the ability to call shared libraries written in other languages, increased ease of use, and new configuration management tools to aid in building large applications. LabVIEW 3.1 for HP-UX is compatible with the recently announced GPIB-HP700-EISA plug-in IEEE 488.2 interface and the GPIB-ENET/HP Ethernet-to-GPIB controller. The software also includes more than 460 instrument drivers for GPIB instruments from more than 40 manufacturers.

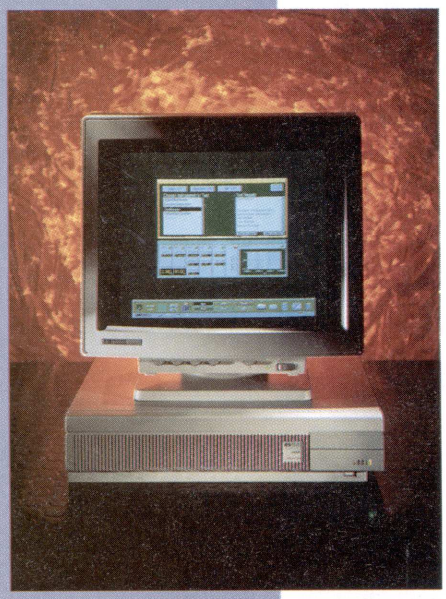
LabVIEW Version 3.1 includes the new VISA Transition Library, which gives instrument driver developers and users an upgrade path to the next-generation National Instruments I/O architecture called Virtual Instrument Software Architecture (VISA). VISA provides a single interface library for controlling VXI, GPIB, RS-232, and other types of instruments.

The GPIB-HP700-EISA features DMA data transfer rates for both read and write operations of at least 5.5 MB/second using the HS488 protocol and 1.3 MB/second using standard 3-wire GPIB transfers. It includes the EISA-GPIB board and NI-488.2M software for HP-UX Version 9, which features more than 50 GPIB-related routines and functions. For HP 9000 Series 700 models without EISA slots, National Instruments offers an external Ethernet-to-GPIB kit that provides instrument control capability from the Series 700 Ethernet port.

LabVIEW Version 3.1 for HP workstations was to be available in December for $2,995.

Contact National Instruments, 6504 Bridge Point Parkway, Austin, Texas 78730-5039, phone: (512) 794-0100 or (800) 433-3488, fax? (512) 794-8411.

National Instruments LabView 3.1



The full suite of Ensign tools can typically be installed in 60 minutes, and requires no other "framework" product to function, the company notes. Ensign brings its standard GUI interface to all the major UNIX platforms in a heterogeneous enterprise.

Contact Boole & Babbage, 3131 Zanker Road, San Jose, California 95134, phone: (408) 526-3000, fax: (408) 526-3053.

Manufacturing Software

Andersen Consulting has announced an alliance to integrate its manufacturing, distribution, and financial software solution, MAC-PAC OPEN, with Premenos Corporation's EDI software (EDI/400 and EDI/e). EDI/400 and EDI/e provide users with comprehensive support for electronic data interchange, including tasks of integration, translation, communications, and document management.

MAC-PAC OPEN is an enterprise-wide, proven software solution designed to help manufacturers operating in a mixed-mode environment improve productivity, efficiency, and customer service.

Whether the manufacturer is discrete, JIT/repetitive, make-to-order, job shop, batch process, or a hybrid, MAC-PAC OPEN has the flexibility to help manufacturers better control their enterprise-wide operations in a client-server environment. For make-to-order manufacturers, the software offers the patented Expert Configurator—a knowledge-based tool designed to improve order accuracy and customer response time.

Contact Andersen Consulting, 69 West Washington Street, Chicago, Illinois 60602, phone: (800) 541-7512 or (312) 507-6588.

Business Software

Uniplex Software, Inc. has announced Uniplex Business Software Version 8. Uniplex Business Software offers customizable office productivity, communications, and graphics application packages for UNIX in both character-based and X Windows-based environments. The major new features of Uniplex Business Software Version 8 include improved e-mail, a new Informix database engine, additional database links, and optional migration paths to Uniplex's onGO Office client-server-based messaging backbone.

Application packs can be purchased separately or bundled together. The

application packages are as follows: Uniplex II Plus, the core productivity suite, including word processing, spreadsheet, and relational database; Uniplex Advanced Office Systems (AOS), a companion package with groupware applications, including e-mail; Uniplex Advanced Graphics system (AGS), a presentation graphics package; Uniplex Datalink, an integrated link to leading databases; and Uniplex Windows, an X Windows-based GUI for Uniplex Business Software.

Version 8 includes a copy of the Informix Version 5 standard engine, as well as optional links to Ingres, Oracle, and other Informix databases, including Informix On-Line. onGO enables Uniplex Business Software customers to connect to an X.400 or SMTP messaging backbone.

Version 8 applications are available for the HP 9000 and other UNIX platforms in both character-based and X-Windows environments.

The cost for Uniplex Business Software Version 8 applications is $100 to $500 per user. The onGO link is available for $400 to $500 per user. Existing users can upgrade to Version 8 for as little as $995 per server.

Contact Uniplex Software, Inc., 600 East Las Colinas Blvd., Suite 1400, Irving, Texas 75039, phone: (214) 556-0106, fax: (214) 831-7100.

Client-Server Sorting

Information Resources, Inc. has announced COSORT Version 4.0, its sort/merge/select/report software for client-server environments.

Automatic tuning improves speed by 15 to 25 percent. IRI's new jcl2scl utility converts the Job Control Language for an MVS sort to a COSORT-sortcl (Sort Control Language) specification file. sortcl is an SQL-based reporting language that uses commands familiar to mainframe sort users. Version 4.0 also features an enhanced sortcl interface. Micro Focus Variable Length records are supported, along with all major C and COBOL data types.

COSORT 4.0 is available on all UNIX-based hardware, with configuration-dependent license fees starting at $990.

Contact Information Resources, Inc., 319 Decker Road, M/S RR1, Craryville, New York 12521, phone: (518) 851-2815, fax: (518) 851-9822, e-mail: cosort@iri.com.

Sybase/HP Alliance

Sybase, Inc. and HP have announced that they will jointly provide service and support to Sybase's workgroup-level customers. Among the customers to benefit from the alliance are those using the SYBASE Workgroup SQL Server 10 bundle and those using Sybase products with Novell's NetWare and Microsoft's Windows NT.

According to the agreement, Sybase and HP essentially act as a single support organization. As part of an ongoing program, HP support engineers involved in this alliance have been given extensive training on Sybase products and are receiving ongoing contact and review by senior Sybase engineers.

Sybase customers calling (800) 8-SYBASE will, depending on the operating system used, be automatically routed to either Sybase or HP. After a case is passed to HP, Sybase continues to monitor the case to lend assistance when needed. Both Sybase's and HP's case-handling performance is measured by a uniform set of quality metrics. ◧

Object Module Transformation

AIB Software Corporation has announced Sentinel II, a multiplatform runtime memory tester for UNIX C & C++ developers. Object Module Transformation (OMT) is a platform-independent technology that enables Sentinel II to monitor all memory accesses that an application performs and detect memory errors before they cause fatal program crashes. OMT is a process by which Sentinel converts object code into a system-independent representation of the program under test. It then transfers this representation into machine-dependent object code with full debugging capabilities.

Sentinel assists developers in isolating and resolving memory access errors and memory leaks in C and C++ applications by detecting them as they occur in the code. Inserting Sentinel into the build and test processes dramatically increases the quality of software applications, the company notes.

Sentinel II was planned for general release on the Sun SPARC in December 1994 with availability for the HP PA-RISC and IBM RS/6000 platforms by March 1995.

Contact AIB Software Corporation, 46030 Manekin Plaza, Dulles, Virginia 20166, phone: (703) 430-9247, fax: (703) 450-4560, e-mail: info@aib.com.

Attention vendors: New product announcements should be sent to New Products Editor, hp-ux/usr *Magazine, Interex, P.O. Box 3439, Sunnyvale, California 94088-3439, USA.*

Deadline for submission is two months prior to publication.

interex

Shared Knowledge.
Shared Power.

Membership Levels *and Service Packages*

The International Association of Hewlett-Packard Computing Professionals

Membership Levels

■ **associate level** includes the following services/benefits:

- **Subscription to either:**
  hp•ux/usr magazine - includes companion Product Directory
  Interact magazine - includes companion Product Directory
- Member rates for Interex Conferences
- Read-only access to Interex Online library
- Membership in your local Regional User Group (RUG) at RUG membership rate

■ **contributing level** includes the following services/benefits:

- **Subscription to BOTH:**
  hp•ux/usr magazine - includes companion Product Directory
  Interact magazine - includes companion Product Directory
- Subscription to *InterexPress,* monthly news publication
- E-Mail account through Interex (includes read-only access to Interex Online library)
- Access to Special Interest Groups (SIGs)
- Member rates for Interex Conferences
- Membership in your Regional User Group (RUG) at RUG membership rate
- Voting Privileges for Board Elections and Advocacy Surveys
  (i.e., system improvement surveys)

Service Packages

■ **online service package** includes ALL the benefits of Contributing Level plus:

- **Software Access**—unlimited downloads from entire library of HP-UX, MPE, and RTE programs (containing over 4,800 programs). Includes one free tape of current Interex Annual Release in the operating system of your choice. Custom tapes from software library are also available.
- **Information Access**—full text search and downloading capabilities for all Interex publications including: *hp-ux/usr, Interact,* Vendor Resource Directories, product news and announcements, and Conference Proceedings abstracts.
- **Member Access**—member directory. Find members with similar interests. Plus access to the *Who's Who* guide of Interex staff, volunteers, and HP liaisons.

Online services are continually upgraded and modified; services are subject to change without notice.

I'd Like to Join Interex

Order Form

Choose one of the following

membership levels & service packages

- ☐ Associate Level, $49.50*
- ☐ Contributing Level, $115.00*
- ☐ Contributing Level Plus Online Package $595.00*

All membership and service packages are based on an annual fee.

Package subscribers, please choose the following:

preferred software format and operating system for the annual tape release

- ☐ 1600 BPI Magnetic Tape
- ☐ 6250 Magnetic Tape
- ☐ Linus Cartridge Tape (CS-80)
- ☐ DAT 4mm

(Check one of the following)

☐ HP-UX ☐ MPE/iX ☐ MPE V ☐ RTE

Please read and sign the following disclaimer: I am applying for services with Interex. I understand that no funds will be returned after any Contributed Software Library (CSL) tapes/disks have been shipped or downloaded from Interex. I agree not to distribute software to any unauthorized users or use software received through Interex on more than one system at a time. I understand that this agreement stays in force even after my services expire or are terminated.

Contact the Membership Department for pricing of the Right-to-Copy License for multiple machine usage

Signature _____

Date ____/____/____

member directory

Please include me in the member directory.

☐ Yes ☐ No Please initial:_____

service agreement

If you relocate, should services transfer with you?

☐ Yes ☐ No Please initial:_____

mailing list

Would you like to receive mailings about other computer-related vendors' products and services? ☐ Yes ☐ No

mailing address

(attach business card here)

name

job title

company

address

city/state/zip

country

telephone/extension

fax

e-mail

billing address (if different from mailing address)

name

company

address

city/state/zip

country

payment options

☐ Bill me ☐ Check enclosed, payable to Interex

☐ Purchase order enclosed, PO#_____

(purchase order accepted for invoicing purposes only)

☐ Please charge my: ☐ Visa ☐ MasterCard ☐ AmEx

credit card number / expiration date

signature

Total payment enclosed $ _____

Foreign currency accepted BUT payment must be equivalent of U.S. currency. Each publication has an annual subscription value of $49.50.

NOTE: Services do not begin until payment is received.

*Canada & Mexico add $25 and all other countries outside the U.S. add $50 for additional postage.

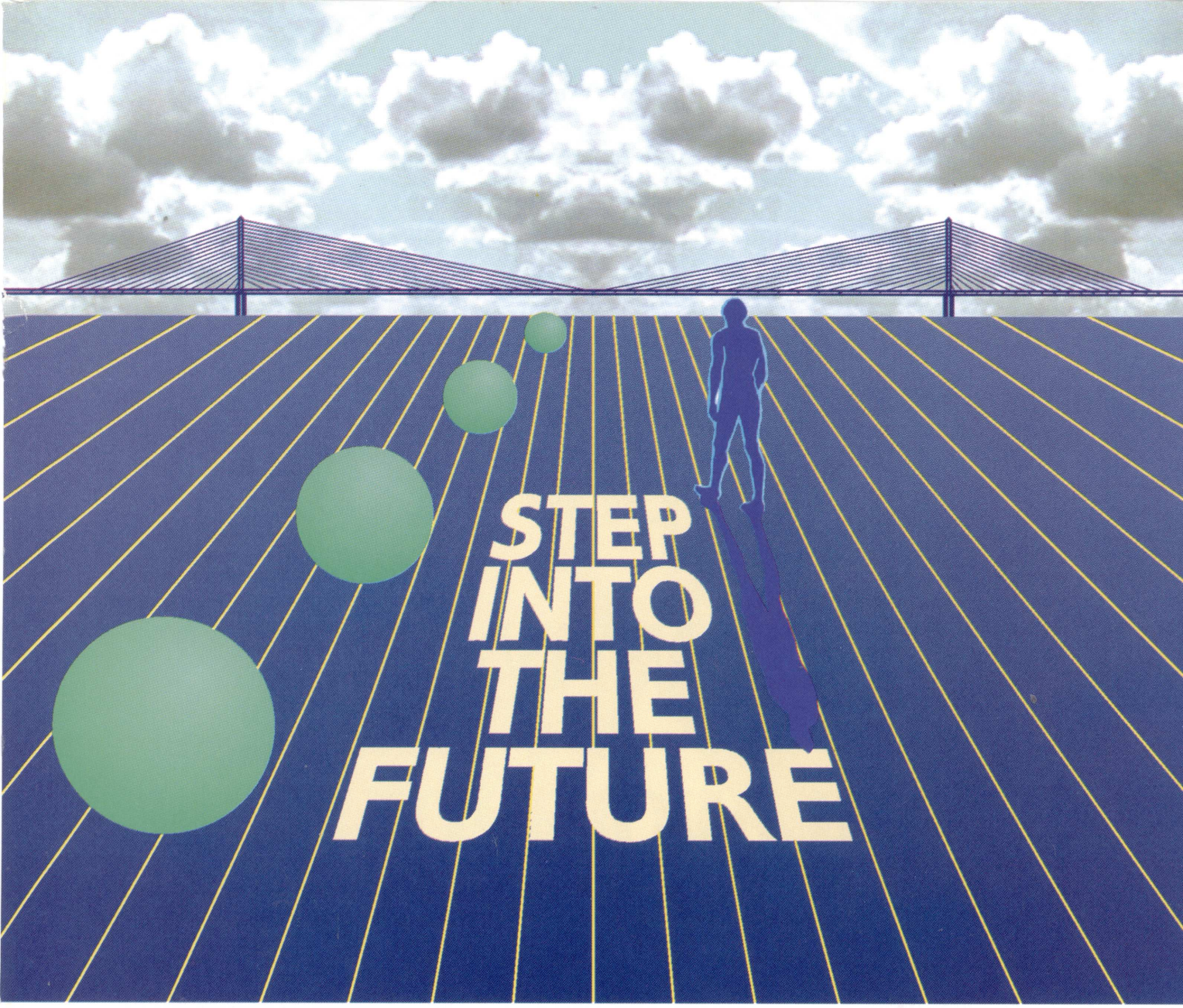
send form and payment to:

Interex, P.O. Box 3439,
Sunnyvale, CA 94088-3439, USA;
fax 408 747-0947
phone: 800.INTEREX, 408.747.0227

95VSSG

Advertiser's Index

Please call or fill out adjacent card for further product information.



OPEN SYSTEMS LASER PRINTING

FANTASIA is an integrated solution for printing forms, enhanced reports, graphics and bar codes. To put it simply, it lets you produce higher quality output at lower cost.

In minutes you can replace preprinted forms by laser printed ones to save you time and money, or enhance your management information reports so that they are easier to read. You can also print graphics and bar codes; in fact

WITH

FANTASIA®

everything you'll ever want to output can be done with FANTASIA.

FANTASIA runs on UNIX, HP3000 and other mid-range host computer platforms. It includes an easy to use PC form design tool.

FANTASIA can be used with any programming language or report writer. FANTASIA is the total solution to your laser printing requirements whether you're using HP LaserJet or other laser printers.

PROACTIVE SYSTEMS®

WHY DELAY CALL NOW FOR MORE INFORMATION: PROACTIVE SYSTEMS INC. CALIFORNIA TEL: 415-949-9100. MICHIGAN TEL: 810-333-7200. VENEZUELA TEL: 582-959 2411. ENGLAND TEL: 0689-877933. FRANCE TEL: (1).49.01.05.00. GERMANY TEL: 0931-2796311. SPAIN TEL: 03-488-23-14.

CIRCLE 104 ON READER SERVICE CARD

Reflection X is simply better. But why take our word for it?

You be the judge. Try Reflection® X free for 30 days, and you'll see why it's 'simply better.'

You'll discover complete PC-to-UNIX connectivity. Reflection X is the first 32-bit PC X server to include advanced TCP/IP for Windows, award-winning VT320 emulation, and sophisticated applications like FTP client and server and LPR/LPD. All from a single vendor.

You'll find Reflection X is easier to use, too, because it takes full advantage of Microsoft Windows. We've added features like drag-and-drop FTP and configurable panning. Plus, our intelligent client startup lets you launch X clients automatically—right out of the box!

Reflection X delivers top performance, reliability, and offers outstanding technical support.

So call today for your free 30-day evaluation. Because when it comes to 'simply better,' you know best.

For your free 30-day evaluation of Reflection X, call

800-92NETWORK.

In Europe, call +31.70.375.11.00

Outside Europe, call 206.217.7100

WRQ Reflection

Making PC Connections Count

Walker Richer & Quinn, Inc. / 1500 Dexter Avenue North, Seattle, Washington 98109 / FAX: 206.217.0293 / Buitenhof 47, 2513 AH Den Haag, The Netherlands / FAX: +31.70.356.12.44